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Battelle Technical Review

IN THIS ISSUE:

Advances in Battery-Power Systems

VIGNETTE

METALLURGIST

GEORGE K. MANNING

As our technology develops more varied types of metallic materials, according to George K. Manning, Battelle metallurgist, the problem of selecting the best materials for a given application becomes increasingly complex. He points out that there exists today a considerable gap between metallurgical knowledge and engineering practice. George and his co-workers are attempting to bridge this gap by studying the behavior of metals in the presence of complex stress fields. To accomplish their purpose, they find that they must speak the languages of the mechanical engineer and the designer as well as that of the metallurgist.

As chief of the Institute's metallurgical engineering division, George is responsible for investigations in several significant areas. His own research activities have related to such problems as the development of the National Emergency Steels of World War II, the heat-treatable steels, and boron-containing steels. He has guided and participated in the development of high-temperature alloys, hot-work die steels, and ferrous alloys. Studies in engineering mechanics, the mechanical properties of metals, and use of alloying additions to enhance the strength of metals have received much of his attention. George has also been concerned with the theory of dislocations and the laws of creep in metals.

Metallurgical research had engaged George's attention prior to his association with Battelle in 1943. As a metallurgical engineer with the Republic Steel Corporation he was in charge of the metallurgical laboratory at the firm's South Chicago plant. There he participated in studies on case carburizing of steel and in the early development of boron-containing steels. George's research activities are reflected in more than 30 articles and papers bearing his name. His professional preparation for metallurgical research included work for a bachelor of science degree at Franklin College and for a master of science degree in metallurgical engineering at the University of Michigan.

George has long been active in professional societies and holds membership in the American Society for Metals, the American Institute for Mining, Metallurgical, and Petroleum Engineers, the American Society for Testing Materials, and the Society of Automotive Engineers. He is currently chairman of the Joint SAE-AISI (American Iron and Steel Institute) Task Force for establishing specifications for carbon steel hardenability. He is also a member of the Low Temperature Panel and of the Test Methods Panel of the ASTM-ASME (American Society of Mechanical Engineers) Joint Committee.

At home, George and his wife Dorothy find their life keyed to three teen-aged daughters. Nevertheless, together they find time to enjoy bridge, square dancing, and dramatics, while George devotes a portion of his spare time to wood-working.

BATTELLE TECHNICAL REVIEW

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Expanding Need for Scientific Knowledge

It is most misleading to say, as has been said so often, that we have dangerously depleted our pool of "basic" knowledge. Such knowledge is certainly not consumed by being used. What does happen, however, is that by using our knowledge we propel ourselves so far into the depths of science that we need more and more profound facts on which to base our research to solve engineering and commercial problems.

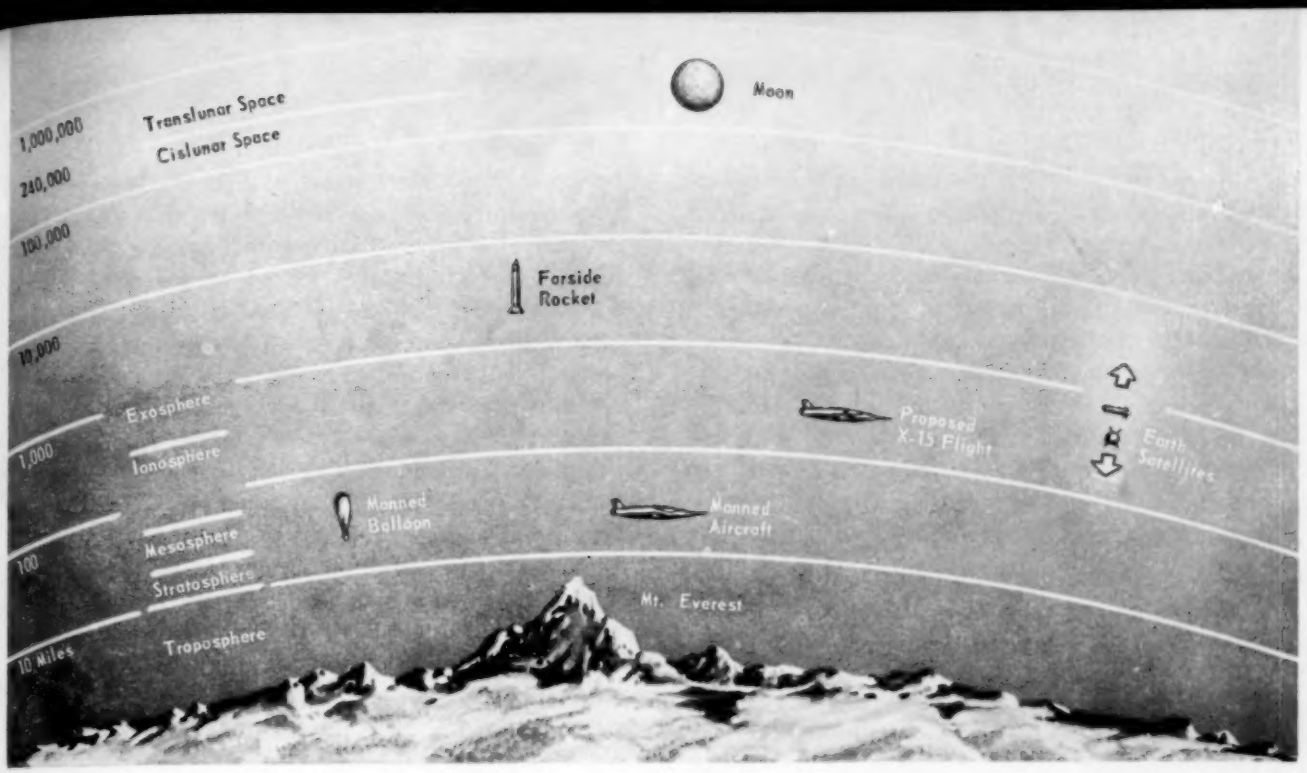
The reasons for the apparently large volume of research to expand knowledge during earlier centuries are numerous and complicated. The principles to be found at that time were somewhat simpler than those remaining undiscovered now. They seemed to involve such problems as direct proportions, inverse square laws, and basic numerical values. Currently, we are living in a much more complicated world. We, and our ancestors, made it that way by elucidating most of the simpler areas of knowledge. We have now come to the point where to expand knowledge we must determine, not guess at (for example), the level and type of radiation a thousand miles out from the earth. We need to know more about steroid chemistry and so need to synthesize cortisone, et cetera. All of these are extremely expensive projects.

. . . In the days of Newton and Galileo, research was done when one could find the time, like backyard gardening now, and almost entirely out of curiosity . . . Now research to expand knowledge, but not solely out of curiosity, can be man's life-long job and he can make a comfortable living at it, which is as it should be. One factor of stimulation for scientists . . . is curiosity, coupled with the desire to do something for posterity . . . The other factor for stimulation is just plain money—to supply the exacting and expensive apparatus needed as well as to support the scientist . . . It is inevitable, I am sure, that the number of important problems and the supply of curiosity will always be far ahead of the money available . . .

Along with *how* to stimulate the expansion of knowledge, we must continually ask ourselves *why* we should stimulate it. We have little idea what additional basic information will be needed 50 years from now. Therefore, there must be some stimulation of research for research's sake, most of which will admittedly pass into limbo and never be heard from again. There will always be scientists who want to push back the frontiers of knowledge because of some rather immediate good it may do. Others have just as strong a desire and fully as great ability, but do not tie their work to practical applications . . .

Society must use the abilities of scientists to the maximum. They have finite lives and they exist in finite numbers. Each lost opportunity for a scientific discovery is lost forever. If Archimedes had not observed buoyancy when he did, someone would have later, but as it is, someone later did something more important because he had Archimedes' principle as part of his fund of basic scientific knowledge.

Dr. Frank C. Croxton, Battelle technical director, from his remarks before the Conference on Basic Research in Civil Engineering of the American Society of Civil Engineers.



The Challenge of the Space Age

The space age challenges the scientist to solve the difficult problems of the propulsion, guidance, and control of space vehicles. The conquest of space also requires better materials, extremely high vehicle reliability, and answers to the psychological and physical problems of man in space. But, as the author points out, many social, political, and other nontechnological problems are being posed for us as well.

by Robert B. Filbert, Jr.

We are seeing today the dawning of a new era in the history of man. For all of his history, man has been bound to earth, the mother planet. But now it is within his reach to step out into space. The challenges, the problems that lie ahead along this route, are many and difficult ones. The task of actually getting into space will be long and arduous. The cost will be tremendous. But once accomplished, no greater influence on the future of our science and technology, our philosophy and arts, our social and political thinking, and our military posture can be imagined.

This will not be an exhaustive treatise, but rather a distillation of the essence of the problems involved in conquering space. They are not insurmountable, we know now. Some of them will yield in time to persevering effort. Others will be circumvented or mitigated by ingenuity and compromise. Still other problems will be overcome by solutions as yet unborn or unimagined. Some are already behind us, or are being resolved right now through present knowledge and technology. As this era grows and develops, it will present its own unique situations, which we should prepare to face and live with.

What are the vital driving forces that shape our venture into space? They are principally: (1) an insatiable curiosity, (2) a military need, (3) a rapidly enlarging fund of knowledge about our universe and the scientific laws that govern it, (4) a technology in being that makes the first steps possible, (5) the scientifically trained and disciplined body of manpower to pursue the goal, and (6) a social, political,

and moral climate which encourages inquiry and experimentation in the belief that the end result will be beneficial. Take away any one of them, and our job would be much more difficult.

Space may be defined as the void that lies beyond earth's atmosphere and runs forever. Or perhaps it lies beyond the envelope wherein the gravitational attraction of the earth is dominant. There is no clear line of demarcation. It is, of course, not *up*, but *out*. We know that it offers an environment hostile to earthly life. Its distances are infinite. Its extent is beyond our comprehension. Why then must we conquer it? The answer is simple—because it's there, and because we have, or think we have, the means.

Propulsion

For our purposes we might divide space into two zones. The first would include everything inside the orbit of earth's moon, which we will call cislunar space. Within this zone lies the near-space which we are now exploring with rockets and satellites. The ultimate journey within cislunar space is the trip to the moon itself, for which we already possess the basic needs. Such a round trip would cover about one million miles and would take 5 to 10 days.

Beyond cislunar space lies the balance of space, or translunar space, the nearer and distant planets of our solar system, and then the big step to the star (Proxima Centauri) nearest our sun, 25 trillion miles (4½ light years) away. Many of the problems we will face in putting a man on the moon will be similar to those presented by travel to the planets and beyond. However, the limit of space travel we can imagine today is with the nearer planets, Mars, Venus, and Mercury.

Today, "space travel" and "rockets" are almost synonymous. After more than 700 years, we have finally found a unique use for the rocket. The first recorded attempt at manned flight by rocket power was made by a Chinese scientist named Wan Hu. He had a number of crude rockets used by the Chinese back in the 13th Century attached to a chair and arranged to have them fired simultaneously. He disappeared in the uproar and was never heard from again.

Today, we are more sophisticated. We use the controlled combustion or reaction of chemical propellants to develop thrust in a rocket engine. The solid-fueled rockets now under development are of comparatively simple construction—the ingenuity here goes into the design of the propellant grain, since the flight program must be built into the grain. Once started, the combustion process connot be stopped or controlled as with the liquid rocket, although recent indications are that this difficulty has been overcome. On the other hand, the liquid rocket, though ideally it may be controlled and programmed at will, is much more complicated and subject to malfunction or failure. Auxiliary equipment must be provided for pumping the propellants, assuring their proper mixing, and ignition. In return for this complexity, besides the control factor, there exists the possibility of regeneratively cooling the combustion chamber and nozzle throat with the propellants, thus adding life to the motor and providing for greater possible total thrust. Another inherent advantages of liquid-propellant rockets is that higher specific impulses can be obtained with liquids than with solids.

Where do we stand today with our chemical propellant systems? We are still depending heavily on systems that were in use or experimental development 15 years ago—liquid oxygen with gasoline or alcohol, fuming nitric acid, and so on. However, new high-performance chemical fuels improve on the performance of the old stand-bys by 50 per cent and promise specific impulse (I_{sp}) values of up to 400 sec., which may well be the upper limit of strictly chemical propellants.

The next step may be in the direction of free-radical propulsion systems, such as atomic hydrogen or the metastable excited state of monatomic species. With such systems, I_{sp} values up to 1,000 sec. and above might be attained. Thermomechanical cycles based on nuclear power are being studied now, as are ion-acceleration schemes based on electrical energy from nuclear power. Major drawbacks foreseeable for these systems are low thrust-to-weight ratios and low impulse. They may, however, provide the space drive

Robert Filbert, chief of Battelle's chemical engineering division, presented the substance of this article before the Golden Jubilee Meeting of the American Institute of Chemical Engineers in June of this year. The breadth of the subject matter in the presentation reflects the breadth of his interests. Since joining Battelle, he has participated in and guided research studies on numerous process developments for the heavy chemical industries, including agricultural chemicals, pulp and paper, pharmaceuticals, and special products; the physical chemistry of high-temperature systems; and the application of nuclear energy to chemical processes. He has been associated also with studies on the recovery and refining of such metals as thorium, uranium, nickel, and cobalt and investigations of liquid rocket-propellant problems. Recently he directed the preparation of the *Liquid Propellant Handbook* for the Armed Forces.

needed to cross vast distances in gravity-free space. Nuclear systems utilizing direct fission or fusion energy offer both high impulse and comparatively long life, but introduce problems of control and containment because of high temperatures involved.

Still further in the future lie the "photon" or radiation-propelled vehicles which conceivably might use energy forms already existing in space, thus obviating transport within the vehicle of all the fuel needed.

The propulsion problems we face are clear. We must find systems which will provide higher impulse over longer periods of time and still not be prohibitively massive. We must find means for containing working fluids at higher temperatures and pressures than is now possible. For each new system developed, a reliable method of control must be provided. Over-all system reliability must be higher than present liquid-engine systems and at least the equal of the best solid engines.

Guidance and Control

It goes almost without saying that the greater the range to a ballistic missile target, the less the proportionate error in guidance that can be tolerated if a direct hit is sought. While our proposed missions into space are not to be ballistic in a sense, still they almost need to be, because of the tremendous lost time and fuel cost if the correct path to the target is not at least approximated from the moment of launching. Without fixed reference points, it will be most difficult for navigators to maintain correct elliptic courses to distant moving bodies through intersecting gravitational fields. And yet it will be vitally necessary to do this in conducting manned space explorations, especially interplanetary ones.

From the moment that the vehicle is free of the earth, the problems begin. First, the almost motionless body must be kept in the proper attitude until it picks up velocity. This may be done by using deflector vanes on the rocket exhausts, or by gimballing the rocket motors. The next important point of control is the burnout velocity, the velocity of the vehicle or missile at the time propulsion ceases, or is terminated. In following a course to Mars from an earth satellite, for example, an error of 10 mph in the initial velocity would cause a miss of 100,000 miles and 4 hours, other factors being ideal.

Position in space means nothing alone. For successful navigation, one must know three position coordinates and three velocity vectors at all times. Any change in velocity during flight will of course shift the course of the vehicle, too, requiring still another correction to compensate for the change. The only means for determining the ship's velocity would be triangulation sights on the sun and planets at intervals and computation of the orbit from the successive sights.

ACCURACY REQUIREMENTS IN BALLISTIC VEHICLES

Goal for Missile	Allowable Misalignment of Velocity Vector, in degrees	Allowable Velocity Error, in per cent
Around moon and return to braking ellipse	0.0017	0.0033
Impact on moon (± 100 miles)	0.018	0.012
Impact on moon	0.63	0.2
Scientific satellite (± 100 miles)	2.2	0.75

Thus we can see that space navigation will require extensive equipment and paraphernalia in the ship plus infinite patience and care from the navigator. Similarly, control from the earth must be done with the utmost accuracy.

Environmental Problems

With all of the engineering problems already stated and implied, another important one is encountered when we consider manned flight into space. As far as we know, there is no point besides earth within our solar system which presents an environment hospitable to man. It is obvious, then, that before manned flight can occur, means must be found for creating and maintaining an artificial environment in space vehicles that will sustain human life for extended periods. A breathable atmosphere and moderate ambient pressures and temperatures must be engineered into such vehicles. The space traveller must be protected from radiations and meteoric projectiles; the radiation hazard especially has been found recently to be much more serious than originally anticipated. The problem of weightlessness and its accompanying psychological effects must be surmounted. Loneliness and claustrophobia must be reckoned with. To investigate these problems, the new field of space medicine has developed. The difficulties, while not inherently insoluble, are aggravated by the great lengths of time over which the space traveller must endure them—a week to the moon and back; eight months to Mars, one way.

In the cabin of the space vehicle, temperatures should be kept between 70 and 90 F. The "air" must be kept properly humidified and free of odors and toxic substances. For extended trips, the food and waste disposal problems become significant. Perhaps the biggest problem is that of supplying breathable atmosphere and disposing of accumulated CO_2. To fit the ma-

chinery for all these functions into the space vehicle will indeed be a challenge.

Aside from the above requirements to accommodate man, there are the basic ones even for unmanned vehicles. The elaborate control, recording, and telemetering devices have their own limitations, too. Fortunately, while man can be altered or improved but little, the instruments and machinery can be designed and built to take the punishment that is likely to be meted out. Although man ultimately must venture into space, there are strong arguments for keeping him on the ground for yet a while.

Recovering of Information and Materials

It is vital during the mechanical exploration of space, and even more so later when man goes along, that means exist for recovering information and materials from space expeditions. This brings immediately to mind the atmosphere re-entry problem. A ship returning from space normally would encounter temperatures which would vaporize it, or at least severely damage it. Many consider the re-entry problem to be the most pressing one at this time. We are all familiar with the earlier blunt-nose concept, and the recent breakthroughs when nose cones were retrieved after flight for study. Numerous research and development programs are going on now to seek the answers to this great problem. As things stand, we could put a man into space, but we couldn't get him back. The flight of the X-15 (USAF) is planned to take a man to an altitude in excess of 100 miles and explore the feasibility of returning to earth. If this is successful, the next step would be a manned orbital ship.

Before man travels into true space, there is need for great improvement of the automatic devices which will report information back to earth, especially the television and photographic equipment we will mount for exploration of the moon and planets. Development of long-lived, reliable power generation systems for both manned and unmanned flight continue to pose a challenge.

Generalized Problem Areas

Materials—structural and chemical. As with every other frontier in engineering science, many problems already mentioned, and others, result from limitations of the materials we have to work with. An old familiar circle appears time and again: e.g., we are limited in the development of new, more energetic propulsion schemes because present day materials do not tolerate the higher resultant temperatures and pressures; at the same time we cannot freely do the materials research and development necessary because of the difficulties of generating the extreme environments for research purposes in the laboratory.

Important steps are being taken now to break the circle. It has been reported that plasma temperatures up to 18,000 F and velocities up to 15,000 mph will be possible in a new 20 million kw electric arc "wind" tunnel now being built. On a smaller scale, a hydromagnetic shock tube reportedly generates temperatures up to 100,000 C. It is significant that advances on the materials front will benefit not only the space vehicle and guided missile interests, but also every other advancing technology as, for example, development of nuclear power plants.

In addition to high-temperature materials development, much effort is going into improving the strength-to-weight ratio of materials for general structural uses. New methods of fabricating and machining are being sought to provide the close tolerances and intricate shapes needed for modern propulsion and guidance systems. Continual progress is being made also in gaining an understanding of the effects of radiation on materials and how to counter them.

The problem of new fuels and propulsion schemes has already been touched on. This problem will be vastly simplified as new structural materials are developed, although much research remains to be done on the fuels themselves.

Reliability. Since a satellite vehicle, or a ballistic missile, costs upward of several million dollars, and remembering the time and effort represented by its development, one can understand the need for a high degree of reliability. Yet as our devices become more sophisticated, their reliability inevitably drops. The idea of establishing in orbit an inhabitable space platform, for example, becomes nightmarish if present-day levels of reliability are not radically improved. Some improvement will come with experience, but basic advances are needed to develop systems that inherently possess greater reliability. This applies universally to propulsion, guidance and control, communications, and structural elements. Perhaps most importantly, it applies also to the preflight testing equipment with which we determine whether the vehicle itself is in ready condition. The struggle for maximum reliability begins way back in the first step of production and fabrication, and permeates the whole industrial process right up to the minute when the component is called into action. The old adage that a chain is no stronger than its weakest link is as true as ever where reliability of a complex system is considered.

Weight Control. As an optimistic estimate, 1,000 pounds of vehicle weight was required at recent

launchings for each pound of satellite placed in orbit. This ratio will be improved, but probably not by a factor of more than 10 at the outside. As the possibilities of manned space travel gradually open up, it is apparent that a premium must be placed on reducing the weight of the vehicle to an absolute minimum. It has been estimated that a manned space flight around the moon would require a paylod of 4,000 pounds, and thus a missile weight at lauchings of 2,000 tons. Everything that goes on such a trip will need to be of the least possible weight consistent with dependable performance.

Psychological and Biological. In a manned flight, tremendous problems also present themselves with respect to the physical and psychological conditions under which persons must operate. Examples of these include: the strange condition of weightlessness; the necessity for living in a space suit in cramped quarters; the inevitable feeling of loneliness and separation from the earth; a strange diet, in all probability; the complex maneuvers required to perform every body function; and unreasoning fear. These provide ample challenge for the space medicine profession.

Contingent Problem Areas

Military. There is no need to dwell on the military aspects of manned space travel. The major impetus today for pushing forward into space comes from the military, although recent efforts have led to the organization of civilian governmental activities. Most of the funds for the fantastically expensive research and development programs currently going on come from the military. Military attitudes and philosophies must be altered to meet the new conditions. Old concepts of strategy and tactics must be revised. It is difficult to imagine limited warfare in a space age.

Public Support. The partisans of space exploration rightfully are concerned about public support for their activities. If public support is not forthcoming, adequate financial support, which almost has to channel through the government, may not be provided. Accepting for the moment the fundamentally humanistic nature of space exploration, it becomes then a problem of educating the general public to a realization that its interests are being served by space exploration, thus gaining its participation and support.

Cost. The cost of missile research and space exploration is high today and is still rising. Estimated military costs for fiscal 1958 reach almost 3 billion dollars. The problem is, how shall this rapidly increasing cost be accommodated without sacrificing other necessary functions and attributes of our business, governmental, and military operations.

National and International Policy. It is impossible to predict what influence the conquest of space will have on the community of nations on earth. Perhaps we will find in space the common sentiment which will serve to unite the human species. Such a sentiment, in combination with weapons which make war unprofitable for winner and loser alike, may spell the end of war. These at least were the views of Freud, expressed 25 years ago in a letter to Einstein.

Education. There is no need to add to present confusion regarding the sufficiency or deficiency of trained scientists and engineers. It is clear that a higher percentage of our working population will need broader technical training in the future. There is a need for specialists in each of the many different fields already touched on; only specialists will be in a position to capitalize on new scientific discoveries pertinent to their fields. And yet, an ever broader basic training will be needed if the specialist is to comprehend the relationship of the parts to the whole, and if one specialist is to communicate effectively with another in a different field. Time is limited, and the span of knowledge is growing ever larger. It seems to some thoughtful persons that the future pattern should be one of mastering basic concepts through formal education, followed by specialization on the job. Others, of course, believe that each specialty should be included in a college curriculum and lead to a degree named after it. Neither side is taken here. Whatever the method, it is essential for us to achieve maximum efficiency in our education programs. If we don't know how to do this, we had better find out.

This review of the complexity and number of unanswered questions facing us in our effort to conquer space suggests that something must be done about coordinating and managing the many activities involved. We cannot afford useless duplication of effort and intramural rivalries. Anything which slows progress or is wasteful, is costly in both time and money and must be avoided. Steps have already been taken to provide central civilian governmental control and to coordinate the military and civilian aspects of space exploration. It is essential that these first measures be augmented and supported, and that they be allowed to function effectively.

Many aspects of the challenge before us have not been mentioned. Some of these are the roles of law, philosophy, history, politics, and the other arts and sciences in the great era now starting. Each will enter the picture somewhere. One thing is certain about the conquest of space: it will require the best efforts of every branch of science, engineering, and education that we can muster; it challenges man on virtually all fronts of his physical and spiritual existence.

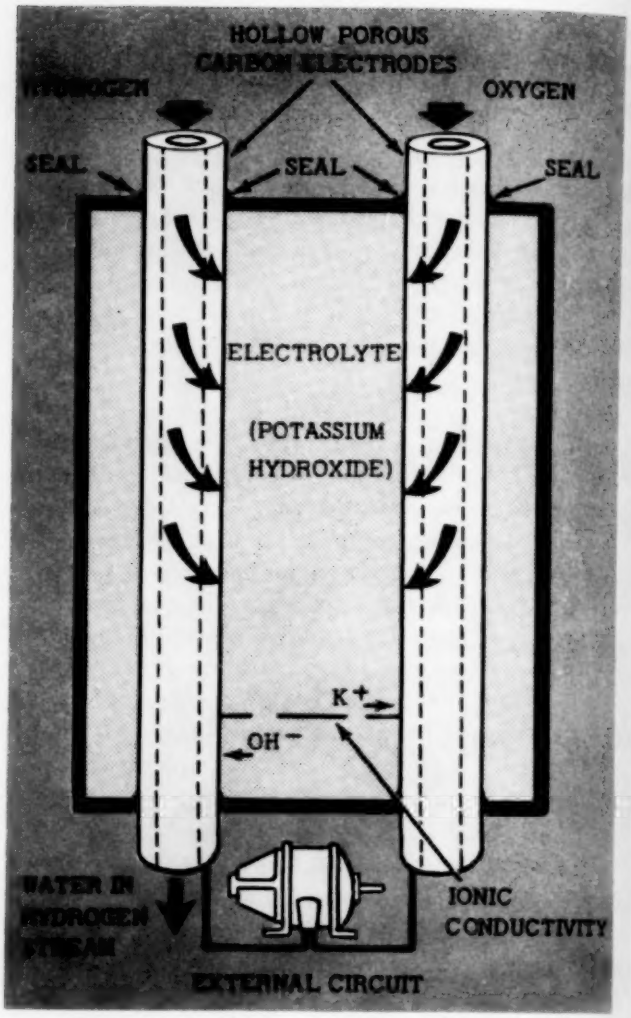
Advances in Battery-Power Systems

The new and unusual demands for electric power sources that have grown out of both civilian and military technology have led to interest in, and development of, new types of battery systems. The demands have grown for both very high and very low power devices. The author describes and discusses advances in both types of battery systems.

by LESLIE D. MCGRAW

UNTIL RECENT YEARS a relatively few types of battery power packs satisfied needs for storage of electric power. Any battery which was not based upon the common dry cell, or the lead-acid or iron-nickel cells was unknown or a curosity to the average user.

Military needs for special-purpose batteries have changed this picture. Moreover, battery developments for the military led to competitive production and marketing of new batteries, while the competitive market for the common dry cell and automobile and motive-power batteries likewise provoked research toward their improvements. Now there are in commercial production and in various stages of development batteries to meet requirements for miniaturization, for performance under unusual environmental conditions of temperature, gravity, spin, shock, and acceleration, and for longer shelf life. Some of these newer accomplishments are becoming commonplace to those modern-minded individuals who look for the convenience of high capacity, light weight, and rechargeability in the power packs for their electronic appliances.



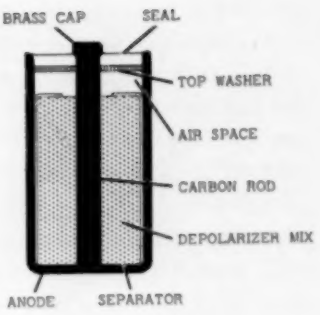
Courtesy National Carbon Co., Division of Union Carbide Corp.

This simplified drawing illustrates the operation of a recently developed fuel cell. Hydrogen and oxygen enter the cell through specially treated, hollow porous carbon electrodes. As the gases diffuse, coming into contact with the electrolyte, the electrochemical reaction releases electrons at the hydrogen electrode. These flow through the external circuit powering the electrical equipment and are accepted at the oxygen electrode. Ionic conductivity through the electrolyte completes the circuit, and the water formed in the reaction passes from the cell in the hydrogen stream.

Electric cells and energy converters are grouped together as battery power sources. An electric cell or battery of cells is a device for direct conversion of the energy of a chemical reaction into electricity. The cell consists of isolated electrodes separated by a conductive electrolyte. Electricity is transferred from the electrolyte to the electrodes through the mechanism of electrode reactions involving the liberation of electrons at the anode and the using up of electrons at the cathode. The sum of the two electrode reactions is called the cell reaction. The negative electrode or fuel for the cell is the anode or anode depolarizer; the

positive electrode or oxidant for the cell is the cathode or cathode depolarizer.

Starting with the high end of the power spectrum, recognition must first be paid to the tremendous strides made toward improvement of conventional secondary (rechargeable) batteries, especially for motive power use. But looking at current research and development, one is inclined to speculate concerning so-called fuel cells and solar converters. The fuel cell is a primary (nonrechargeable) cell, capable of delivering continuous power from an almost unlimited supply of a cheap fuel which may be said to constitute the anode or negative electrode and of an oxidant such as air which constitutes the cathode or positive electrode under conditions of unattended service.



The common dry cell, of which a sectional view is shown here, is the most economical of primary batteries. It was one of the earliest converters of chemical into electrical energy and is still one of the most important sources of portable electrical power.

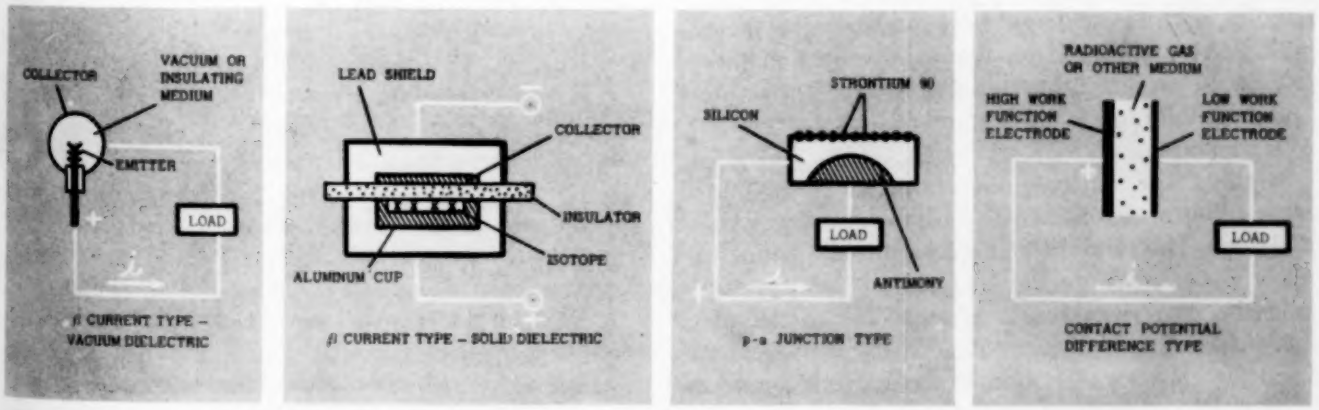
Fuel Cells and Solar Converters

Since the middle of the nineteenth century there have been sporadic attempts to develop a practical fuel cell. Common fuels and oxidants such as hydrogen and oxygen furnished reversible electrodes but were not adaptable to continuous high-rate performance. These, or other carefully selected materials, had to be used in order to dispose of the combustion product of the cell (in this case, water). Only recently has the hydrogen-oxygen cell been developed for continuous low-temperature operation. This development is considered a landmark in fuel cell technology; a working cell, rated at one kilowatt, was on exhibit at the Brussels World Exhibition in 1958.

Other fuel cells are in various stages of development, and one wonders when a cell which utilizes carbonaceous fuel will be perfected. Efforts in this direction are in progress; high-temperature cells fueled with water gas are under study. The prospects of a low-temperature cell utilizing carbon monoxide or methane are attractive. To date there is no breakthrough in the search for catalytic electrodes to overcome the activation energy barrier to the chemical changes required for the release of electrons from such fuels at room temperature. Low-temperature chemisorption of these fuels should furnish the clue to suitable electrode materials.

The solar cell or "battery" is in reality a converter or assembly of converters of solar energy into electricity. Such a converter is usually used together with a means of storing the energy; hence the term solar cell or battery. Solar converters are attractive as coupled with storage batteries partly because they simplify the problem of storage of electrical energy. Rather literally the energy need be stored only "for a rainy day" and, of course, overnight. The earliest solar converters utilized solar heat to operate a steam engine and dynamo. On that basis the maximum energy available is about one kilowatt for 15 square feet. At present, there are no cheap engines available that are capable of even ten per cent conversion of solar energy into electricity. Collection of solar heat at high-temperature levels is also a problem which must be solved if heat engines are to operate at high-conversion efficiency. Such engines are limited by the thermodynamic requirement that a high temperature is necessary for efficient conversion.

The need for high-temperature conversion can be



Schematic drawings of several types of nuclear batteries. Each is an approach to the ultization of radioactive fission products for supplying small amounts of electric energy. They all represent miniature cells of long life which are largely unaffected by temperature.

avoided if the light energy of solar radiation is used rather than the heat energy. Photogalvanic and photovoltaic cells utilize such energy. The development of the silicon-solar battery has led to its immediate use for special-purpose applications. Today, the materials cost for high-power applications of solar batteries is prohibitive. However, low-power applications to instrumentation in rockets and satellites are rewarding, and research into semiconductors for improvement over the silicon *p-n* junction is in progress.

Should solar converters reach a state requiring storage of vast quantities of energy, the difficult problem of storing power must be faced. Possibly storage of electric energy will be avoided by some such subterfuge as storage of hydrogen and oxygen made from electrolysis of water by solar energy. The stored gases would be used in a fuel cell.

Nuclear Cells

Nuclear cells offer prospects of compact, long-lived, stable sources usually of small amounts of power. Such cells are immune to environment, particularly to low temperature. These low-power devices are designed mostly to meet military specifications for undisclosed applications. Nuclear cells may be divided conveniently between high-voltage and low-voltage types. In the former, a beta-emitting radioisotope is separated from a collecting electrode by a vacuum or a solid dielectric. The battery charges itself as a capacitor between periods of use. This type of cell provides thousands of volts, but its steady current is measured in micro-microamperes because there is no multiplication of electrons.

A second general type of nuclear cell gives potentials in the neighborhood of 1 volt, and currents measured in microamperes. This is a more versatile battery from the point of view of new developments. For example, there are uses in conjunction with thermopiles, with ionizable gas between dissimilar metals, with barrier-type cells bombarded by beta particles, and uses involving the two-step conversion of beta energy to light in a phosphor and of light to electricity in a photocell.

High-voltage nuclear cells received early public recognition as strontium-90 batteries having a solid dielectric. The solid dielectric must be thin enough to allow penetration by the high-energy beta particles from the radioactive source attached to one electrode, but thick enough to prevent flow of reverse current from the collector electrode by the low-energy secondary particles, such as air ions, created by the beta particles. A tritium battery, containing 1/5 curie of tritium and capable of producing 50 micro-microamperes at 400 volts would weigh only 0.2 ounce and occupy a volume of 0.05 cubic inch.

Vacuum-dielectric tritium batteries have been produced to deliver 1 microampere at 1000 volts in 1 cubic-inch units. All such cells are constant-current charging devices which can produce no high-flash current. Surge currents can be supplied by coupling them with capacitors. The thermoelectric type of nuclear cell or battery is quite naturally affected by environmental conditions, being essentially a thermopile activated by heat from a radioactive source. Cold junctions are maintained at the outer surface temperature of the battery. Efficiency of these batteries is dependent on the absolute temperature of the heat source as in all other heat engines; voltage is proportional to the number of junctions. A safe and useful energy source such as polonium-210 is expensive; and overall efficiencies to date are low, only tenths of a per cent. By-product polonium-210 may become available from bismuth-cooled nuclear reactors for use as a heat source. The isotope might then be economic for some uses.

Nuclear batteries which develop power between dissimilar metals separated by a gaseous electrolyte depend on unequal work functions of the metals for potential and on ionization of the gaseous electrolyte for internal conductivity.

New Electrochemical Systems

New electrochemical systems for battery power have been developed to provide characteristics of long life

As a member of Battelle's electrochemical engineering division, Dr. McGraw has been associated with varied aspects of battery research and development. Among these have been the development of corrosion-resistant grid metals for storage batteries, the investigation of potential electrochemical battery systems, a study of possible improvements in nickel-cadmium batteries, and work on the development of an electrochemical amplifier. Other studies in which the author has participated include the electrowinning and electric refining of metals, hydrogen-embrittlement of high-strength steels resulting from electroprocessing, and electroplating techniques. Earlier, Dr. McGraw taught chemistry at Webster College of St. Louis University after receiving his master of science and doctor of science degrees at Carnegie Institute of Technology.

and stability, characteristics which are found in some nuclear cells. Typical of such developments is the solid-electrolyte battery. The term battery is used because these low-current cells are usually used in a series-connected stack or battery to provide high voltage. The solid electrolyte or salt has much lower ionic conductivity than aqueous electrolytes. Still its ionic conductivity is much greater than its electronic conductivity. Typical solid electrolyte battery systems are the following unit cells:

$$Pb/PbCl_2/AgCl \text{ and } Ag/AgI/I_2$$

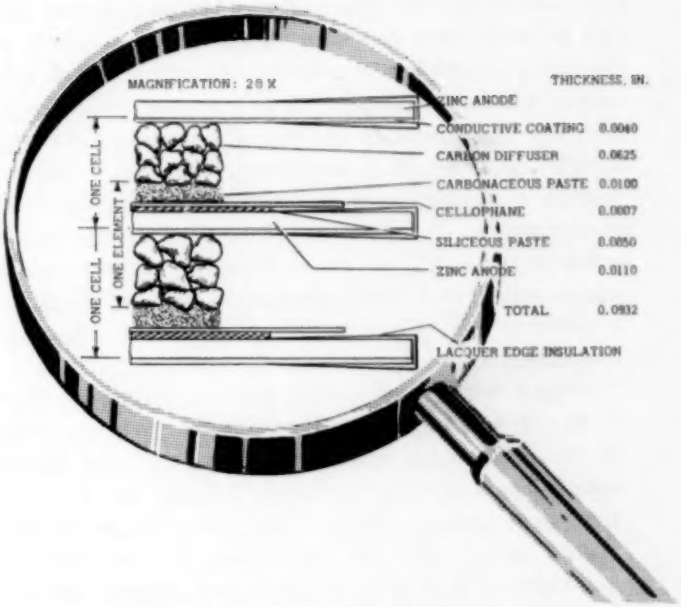
The inherent limiting factor in the shelf life of such cells is electronic leakage through the solid electrolyte leading to internal, open-circuit discharge. Supressants of electronic conductivity are known.

Solid electrolyte cells must, of course, be thin structures owing to the high resistance of the electrolyte. This high internal resistance leads to essentially voltage-producing devices. For example, a one-inch-long battery might contain enough series-connected cells to deliver 100 volts at a continuous drain of 10 micromicroamperes. Higher momentary, flash currents could be drawn from such cells which is an advantage over high-voltage nuclear batteries supplying a constant current.

Ion-exchange cells are related to solid electrolyte batteries in that they contain solid electrolyte of ion-exchange resin for ionic conductivity. This system can lead to a variety of cells: secondary cells when dissimilar metals such as zinc and silver are separated by ion-exchange resin in the zinc ion state to be converted by a charging current to the silver ion state; primary, as for example, when ion-exchange resin replaces electrolyte of the Le Clanche (dry) cell. These cells have the inherent advantages of solid electrolyte cells with the prospect of slightly higher current ratings.

New Depolarizer Materials

Cells containing electrodes depolarized by novel materials such as organic compounds or gases are not new in principle. However, new developments in these areas are leading to special-purpose batteries. For example, organic cathode depolarizers (the equivalent of MnO_2 in the common dry battery) have been suggested for use in reserve batteries. In reserve batteries, some essential component of the battery is missing which must be added just prior to use. Thus in water-activated batteries, the solvent for the electrolyte is added at the moment of need. This might apply to reserve cells having organic depolarizers. The



Detail of two cells of a chlorine-depolarized battery. This reserve-type battery would be enclosed in an evacuated pressure vessel with a supply of chlorine available. Once chlorine is introduced into the vessel, the battery will deliver a relatively high current for its size. It provides a reliable means of storing emergency power for the operation of small components.

main production types of reserve batteries are the silver-zinc; silver chloride-magnesium, water activated; and cuprous chloride-magnesium, water activated. In gas-depolarized systems, the active cathode ingredient is a gas (say chlorine) which is added to the battery at the moment of activation. In a thermally activated battery, heat sufficient to bring the electrolyte to a conductive state is the missing ingredient. All reserve batteries have some "weakness" in their design or composition which makes them unstorageable in the activated state. On the other hand, to be practical, each reserve-type battery must offer some advantage once activated. Most reserve primaries are suitable where great energy and power are required. Some are exothermic upon discharge which leads to good, continuous low-temperature performance. The unusual nature of the electrolyte itself may suit the cell to low-temperature use. All such cells have the potentiality of long shelf life in the unactivated condition.

New Materials and Designs

The many subtle changes in materials of construction and in design which have led to improved service and shelf life for conventional primary and secondary cells cannot be covered in a review article such as this. Instead, mention will be made of some of the replace-

ment or companion cells to the older Le Clanche and Plante work-horse batteries. A relative newcomer to the dry-cell field is the mercury cell consisting of zinc anode, alkaline electrolyte, and mercuric oxide cathode. The high capacity of this cell per unit of size and weight, and its high discharge rate and excellent voltage regulation have given this cell a firm foothold in commerce. The mercury cell has been perfected to a state requiring no more frequent checking and maintenance than the common dry cell. It might be considered the "Cadillac" of primary cells; it is not irreplaceable but is very nice to own.

Among secondary (rechargeable) batteries, there is, as yet, no compromise between the devoted service of the inexpensive lead-acid battery and the special conveniences and performances offered by the more expensive types of alkaline batteries. The much publicized nickel-cadmium (alkaline) battery with its maintenance-free long life, and good low-temperature performance has found a new market involving low cost per unit. This takes the form of small sealed units which offer convenience and novelty to uses otherwise dominated by the dry cell. A more important feature of the sealed-cell design is the resulting freedom from maintenance involving addition of water. The cells can be used to store energy in areas which are isolated or inaccessable, for such purposes as reserve power for telephone amplifiers fitted with solar converters. Nickel-cadmium cells are not damaged by overcharging nor by standing in uncharged condition.

The silver-zinc battery system is relatively new as a secondary battery. Recent developments have increased its shelf and cycle life which, however, are still rather limited. Its advantages are lightness, high power and a constant discharge potential for a given drain rate. On the other hand, its low-temperature characteristics are relatively poor, and it can be damaged by over charging. Compared to other batteries with equal capacity, the silver-zinc battery is 1/5 to 1/6 the size and weight of lead-acid or nickel-cadmium batteries.

In general, the alkaline batteries maintain a charge longer than the lead-acid battery, and may be stored in the discharge condition for long periods.

Batteries, of course, always bring to mind highly refined oxidizing and reducing agents which are to be "burned" under controlled conditions so as to produce electrical energy. The costs of the fuel and the oxygen source used in a primary cell are relatively high. The case of zinc and a metal oxide is typical. The substitution of an acid-base reaction for an oxidation-reduction reaction in an electrochemical cell would be welcome from an economic point of view. A "protochemical" cell has been demonstrated in which the free energy of an acid-base reaction, i.e., proton rather than electron transfer, is made directly available as electrical work. From a practical point of view, the drawback to present consideration of the system as a battery power source is that the current produced is ionic rather than electronic. The protonic conductor employed was glass which is too resistive for any but special-purpose battery use. In this cell, one face of a protonically conducting glass film is reversible to hydrogen ions in solution while the other face (coated with insoluble lauric acid, HL, and barium laurate, BaL_2), is reversible to barium ions. The cell potential corresponds to the free energy of the acid-base reaction:

$$\tfrac{1}{2}\,BaL_2 + HCl = HL + \tfrac{1}{2}\,BaCl_2.$$

If the current-carrying ability of glass for protons were high, advantage could be taken of the low cost of the active materials as a source of electric power. Even in its present state the system offers possibilities for improving conventional batteries for low-power applications requiring extended shelf life and stability. The glass carrier of ionic current could be used as a separator for a battery having conventional electrodes.

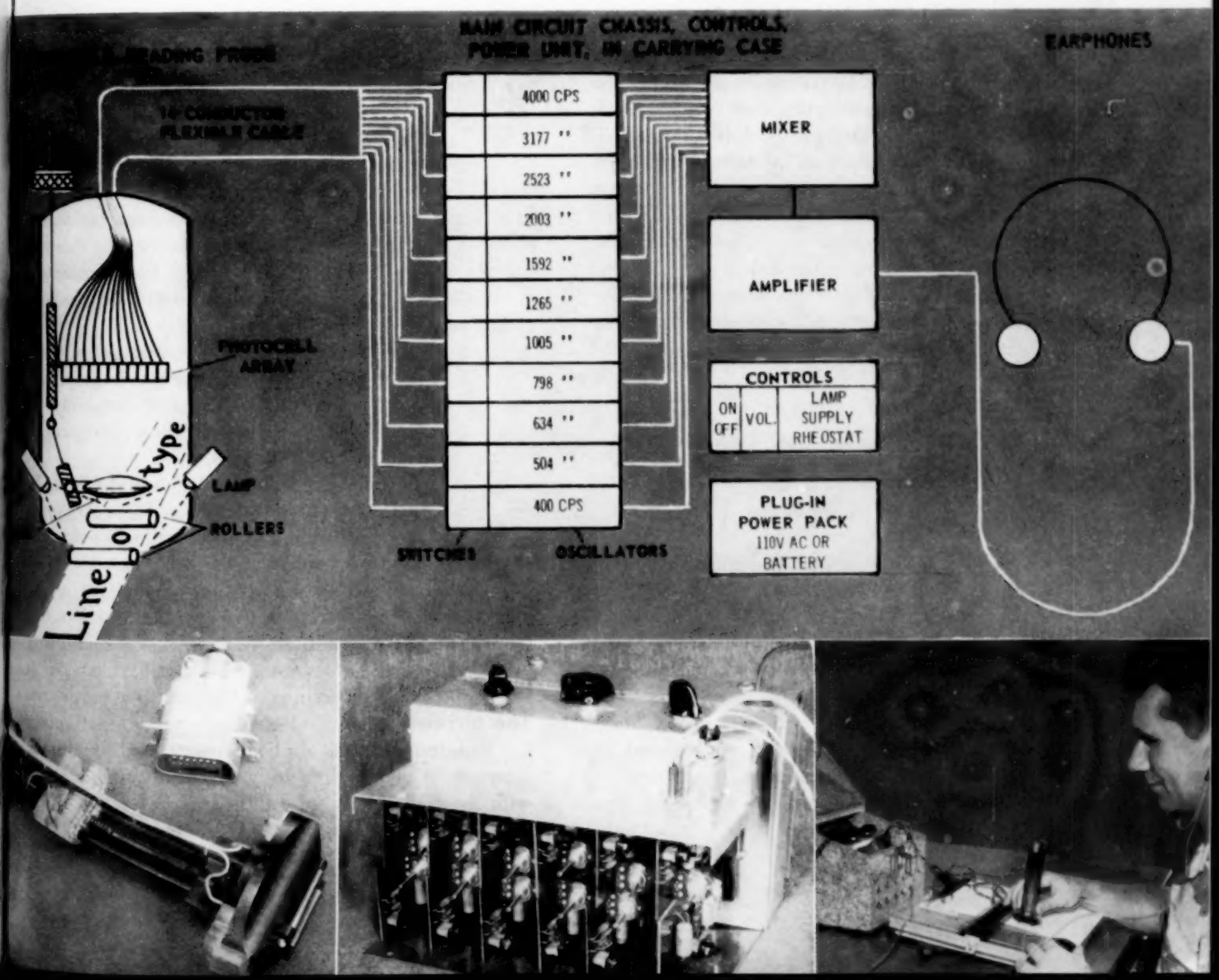
Electric power requirements began with moderate needs and have since spread in two directions: toward very high- and very low-power devices. There are available a large number of ionic conductors which could be used instead of wires for fabrication of miniaturized "ionic" rather than electronic equipment, and could be powered by such a cell as described above. Military needs for low-current, ultraminiature equipment justify a look into batteries which generate, and devices which operate on, ionic currents.

"Outside his laboratory, his [the scientist's] task is to educate us in what is going on inside it, and to give it a meaning for us. In a world in which statesmen as much as voters are ignorant of the simplest implications in science, this is a formidable responsibility."

J. Bronowski

PRINT READER FOR THE BLIND

A portable "aural reading machine" with which the blind can read conventional printed materials is under development at Battelle, in research supported by the Veterans Administration. The reading probe (photo and diagram, left), which scans the print, is correctly positioned above and moved along the print by rollers. Small lamps illuminate the letters which are then focused one at a time by a lens upon an array of photocells, each of which scans a portion of the vertical space a letter may cover. When a photocell "sees" black, it actuates the oscillator to which it is connected. The transistorized oscillators are housed in the case of the reader (photo and diagram, center) along with the mixer and amplifier. The frequencies created by the oscillators as each letter is scanned are combined in the mixer, amplified, and heard by the user (right) as organ-like chords. Each letter can be distinguished by its characteristic tone pattern. Only five prototype models of the reader have been made to date. According to John K. Wetherbee and his Battelle colleagues on this study, users, once trained to interpret the tone patterns, should attain reading speeds of 15-30 words per minute.



NOTES from BATTELLE

FRICTION AND TITANIUM

One outgrowth of the wider use of titanium is the demand for better methods of lubrication where the metal is in sliding contact with itself or other metals. Under such conditions, conventional liquid lubricants allow titanium to seize and gall. While halogenated hydrocarbons and simple halogen compounds reduce galling somewhat, more effective methods of lubrication are required.

According to Battelle metallurgists Paul D. Miller and Jim W. Holladay, research has shown that the problems can be partially overcome by modifying the surface of titanium and lubricating that surface. Studies summarized by the Defense Metals Information Center (formerly the Titanium Metallurgy Laboratory) indicate that the application of metal coatings appears to be the best solution for seizing and galling because the friction and wear are removed from the titanium itself. Of the more than a dozen metals that have been studied, nickel coatings have proved to be most effective. The most effective nonmetallic coatings now available appear to be cyanide, nitride, and fluoride compositions.

RESEARCH BY STATES

The National Science Foundation, in its exploration of the role played by each part of the national economy in the total research effort, has made a study of the part played by the States. A recently issued summary report, *Scientific Activities in Six State Governments,* presents the results of studies of research activities of six States chosen as representative of major geographical regions, resources, size, and economic characteristics. The States selected were California, Connecticut, New Mexico, New York, North Carolina, and Wisconsin.

According to the report, of a total $69 million for all scientific activities in the six States, over $57 million was reported as expended for the conduct of research and development. A breakdown of the latter figure reveals that 63 per cent was accounted for by the agricultural experiment stations and the state universities. Also included in research and development were such areas as health and welfare, education, resource development and public works, and safety.

The $69 million reported as expended for scientific activities represents about two per cent of the total expenditures by the six States for all purposes. Of this amount, over $15 million was contributed by the Federal Government. Of the balance, $48 million came from state appropriations and more than $5 million from various other sources such as gifts and grants.

The study was conducted by the Institute for Research in Social Science of the University of North Carolina. Copies of the report are available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

ELECTROPLATING ON THORIUM

The use of thorium in nuclear reactors has prompted an interest in the development of methods for plating the metal. Thorium, like magnesium, uranium, and zinc, oxidizes easily and corrodes readily in boiling water. Hence, the Atomic Energy Commission was interested in the application of coatings that could provide desirable surface properties.

About ten years ago, a process for plating on thorium was worked out at Battelle. Later, electroplated and conversion coatings that would protect thorium in boiling water were studied briefly. The report on the studies have now been declassified.

Battelle technologists John E. Beach and Glenn R. Schaer report that when thorium surfaces are pretreated by anodic pickling in hydrochloric acid and chemical pickling in sulfuric acid, the metal can be electroplated with coatings of most metals. The adherence of the plated coatings is excellent and passes all the conventional adherence tests. It was found that electroplated metals can protect thorium in boiling water and aid in the joining of thorium to other metals. The successful use of electroclad metals on thorium for high-temperature applications depends upon the selection of metals that do not form unsuitable alloys with the thorium by interdiffusion.

* MAP FOR STRATEGISTS

The planning of military strategy today calls for maps that represent large sections of the earth and that accurately portray all distance and size relationships. Moreover, maps for strategic planning must be large enough to be seen by a number of persons at one time. A study is currently in progress at Battelle for the Rome Air Development Center of the Air Research and Development Command to develop a map with the desired qualities. The planned 20-foot-high concave globe-type map, when completed, will look like a large round bowl standing on edge and with the familiar features of the northern half of the world on its inside surface. The big hemisphere and other equipment to be used with it will be the result of a year's study involving graphic art and human engineering specialists at Battelle.

James M. Dugan, in charge of the research, said that present plans call for the development of an inverted globe-type map showing the northern hemisphere from 20 degrees north latitude to the Pole. This area encompasses most of North America, Europe, and Asia. The map will be permanently installed in a specially equipped room for use of high-level Air Force planners concerned with complex global operations. It will fill one side of a special viewing room equipped with 20 desks set in four terraced rows, permitting an unobstructed view of the entire hemisphere from any of the desks.

"The object of the study", Dugan explained, "is to develop a large and finely detailed map that accurately portrays all distances and size relationships. To avoid the distortions inherent on flat maps, we knew from the outset that we would have to use a large globe-type map—in this case, 20 feet in diameter. The problem was to find a way to get 20 people close enough to the map to see it in detail. If we were to use a convex hemisphere, not all of the viewers could see all of the map at any given time."

Considerable work remains to be done before the study at Battelle closes, Dugan said. Among other things, scientists will be concerned with a projector that will superimpose various symbols on the map. They expect to use a projector similar to those employed in planetariums to simulate the movement of heavenly bodies. In this case, the projector will be used to show such items as bases, movements, weather conditions, and other information. "There are many details to be worked out", Dugan commented, "but when this study is completed, we hope to provide the design for a map and auxiliary equipment that will make it possible for people to have a better look at the world than they've had in the past."

CLARENCE H. LORIG (center) receives the congratulations of Dr. B. D. Thomas, Battelle's president, after his designation as president-elect of the American Society for Metals. J. Harry Jackson, manager of the Institute's department of metallurgy, stands beside Dr. Lorig. Technical director at Battelle, Lorig was inducted into office on October 29 at the Society's annual meeting. He was one of the small group of scientists originally assembled as the nucleus of the Battelle staff by its first director, Dr. H. W. Gillett. In his 25 years at the research center, Dr. Lorig has been closely associated with, among other things, the development of many of the refractory or high-temperature melting metals, including tungsten, molybdenum, titanium, zirconium, and chromium.

Writings by STAFF Members

Proceedings of the 1956 Regional Conference on Reactive Metals. American Institute of Mining, Metallurgical, and Petroleum Engineers, contains the following papers by staff members:

Heat Treatment and Mechanical Properties of Ti-Mo Alloys. F. C. Holden, H. R. Ogden, and R. I. Jaffee, pp. 161-168.

Six ingots containing up to 25% Mo were forged, annealed, and finally swaged to ¼-inch-diameter rods. After heat treatment, mechanical properties and microstructure were determined. The hardness, tensile strength, and yield strength are increased with increasing composition up to about 5% Mo, with a corresponding drop in ductility and impact resistance. As the composition is increased to 7.9% Mo, a considerable drop in yield strength is observed, accompanied by an increase in ductility and impact resistance.

The Properties and Applications of Rhenium. C. T. Sims and R. I. Jaffee, pp. 67-72.

The metallurgical behavior or rhenium points the way to important small-volume applications, particularly in the fields of electricity and electronics. It can be fabricated by powder metallurgical techniques. Attempts at hot-working have been unsuccessful, but cold working is feasible if gentle at first ,followed by more extensive reductions.

Rubber Chemistry and Technology, v. 31, No. 2, April-June, 1958, contains the following articles by staff members:

Bound Rubber and Mechanical Properties of Diene Polymers. S. T. Palinchak, E. E. McSweeney, W. J. Mueller, and P. B. Stickney, pp. 374-386.

Vulcanizates were prepared by different processing techniques, each having originally approximately the same amount of bound rubber in the uncured state, and the effect of processing conditions on mechanical properties was determined. The effects of surface activity and dispersion of the black on mechanical properties were also studied.

Bound-Rubber Formation in Diene Polymer Stocks. P. B. Stickney, E. E. McSweeney, W. J. Mueller, and S. T. Palinchak, pp. 369-373.

The work described seems on the whole to support the hypothesis that bound rubber is formed as a result of a chemical reaction. It is suggested that bound-rubber formation is polymer-gel formation initiated catalytically by carbon black.

Management and Operation of a Privately Owned Hot Cell Facility. G. D. Calkins and J. E. Whitney. *Hot Laboratory Operation and Equipment*, v. 3, 1957, pp. 42-46.

The results of a year and a half of experience in the management and operation of Battelle's hot cell for facility are described. Important factors are reviewed, including the type of work conducted, method of operation, organization and training of the staff, multiple-shift operation, and typical costs of operation.

Members of the Battelle staff are authors of the recently published articles and books listed on these pages. In most cases, reprints are available from the Battelle Publications Office, 505 King Avenue, Columbus 1, Ohio.

The Bibliographic Research Team. Marjorie Y. Fizette, Bruce E. Jones, and Robert W. Gibson, Jr. *Special Libraries*, v. 49, no. 6, July-August, 1958, pp. 253-255.

The efficiency of research work can be greatly improved by utilizing information specialists as an integral part of the research team. At Battelle a team concept of bibliographic preparation has been evolved. The team is made up of an information specialist, technically trained along a general, rather than specific course, and a subject expert, one who is working in or is well acquainted with the field in question. By frequent consultation, the team establishes a field of search which is concise yet adequate within a limited time of budget.

The Effect of Size of Scrap on the Tapping Temperature of a Cupola. N. H. Keyser and W. L. Kann, Jr. *Modern Castings*, v. 34, August, 1958, pp. 59-60.

The study shows that, with a particular cupola, more coke is required for heavier scraps at a given tapping temperature with a fixed blast, and temperature can be adjusted by controlling charged scrap characteristics.

Infrared Transmitting Glasses in the System K_2O-Sb_2O_3-Sb_2S_3. Burnham W. King and George D. Kelly. *American Ceramic Society Journal*, v. 41, September, 1958, pp. 367-371.

An area of glass formation in this system was investigated. Glasses were obtained that could be formed by melting in air and casting. The glasses transmitted to about 8μ and were most transparent in the range 3.5 to 6.0 μ. They had good resistance to atmospheric attack.

Comparisons Between Welds in Iodide- and Sponge-Base Titanium Alloys. W. J. Lewis, M. L. Kohn, and G. E. Faulkner. *Welding Journal*, v. 37, September, 1958, pp. 385s-390s.

Describes the preparation of 18 experimental alloys and presents the results from base-metal, weld-metal, and weld-joint studies. For applications requiring good notch toughness; Ti-V alloys would be more desirable than others investigated, and Ti-Fe alloys would be least desirable.

Nuclear Power Costs Today and Tomorrow. Harlan W. Nelson. *Coal Age*, v. 63, September, 1958, pp. 70-77.

Concludes the U.S. will not need nuclear power for the next ten to twenty years but that it will find demand before 2000 A.D. Present nuclear power plants costs are quite nebulous but some cost-reduction data are now being received; first applications will be in high-fuel-cost areas (Europe). Since fuel makes up only about 15% of the delivered cost of electric power, consumers served by nuclear plants are not likely to gain lower monthly bills.

Titanium at Temperature. H. R. Ogden. *Product Engineering* (Design Digest Issue), v. 29, no. 37, mid-September, 1958, pp. B2-B4.

Describes mechanical properties, thermal stability, oxidation and contamination resistance of titanium. Titanium and titanium alloys are equal to stainless steels at 800-1000 F.

Carrier Mobilities in InP, GaAs, and AlSb. F. J. Reid and R. K. Willardson. *Journal of Electronics and Control*, v. 5, no. 1, July 1958, pp. 54-61.

The majority carrier mobilities in n-type InP and GaAs and p-type AlSb have been measured as functions of impurity concentration and temperature in single crystals. Considerations of scattering of the charge carriers by ionized donors and acceptors suggest lattice mobilities at 300 K of 11 500 cm^2/volt sec for electrons in GaAs, 6600 cm^2/volt sec for electrons in InP, and 450 cm^2/volt sec for holes in AlSb. Total ionized impurity contents can be estimated from the effects of impurity scattering on the carrier mobilities. The temperature dependencies of the electron mobility due to lattice scattering in the InP and the hole mobilities in GaAs and AlSb are gerater than T^{-3}. The effective mass of the holes in AlSb is about $0.4m_o$.

Bibliography of the Liquid-Solid Cyclone 1939 to 1957. O. F. Tangel, R. J. Brison, and D. A. Jacobs. Battelle Memorial Institute, Columbus, Ohio, 1958, 18 pp.

This is an enlarged revision of a previous bibliography on this subject which covered material published or presented before 1955.

BATTELLE TECHNICAL REVIEW

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AERONAUTICAL ENGINEERING

14102 Aerodynamics of Supersonic Flight. An Introduction. Alan Pope. 2nd Ed. 243 pp. 1958. Pitman Publishing Corp., New York. (TL573 P81a2)

Objective is to provide a text at the lowest possible level for a one-term course in supersonics. Covers flow in ducts, shock waves, and wind tunnels.

14103* On the Accuracy of the Representation of a Lifting Line by a Finite Set of Horseshoe Vortices. A. R. Collar. *Aeronautical Quarterly*, v. 9, pt. 3, Aug. 1958, p. 232-250.

Examines the error involved when the continuous distribution of lift on an unswept lifting surface is represented by a finite number of horseshoe vortices, the strengths of which are determined by a prescribed downwash. Attention is directed mainly to the case of elliptic loading, but an anti-symmetrical case is also studied to ensure that the conclusions are not peculiar to the elliptic case.

14104* The Influence of the Wake on the Flutter and Vibration of Rotor Blades. J. P. Jones. *Aeronautical Quarterly*, v. 9, pt. 3, Aug. 1958, p. 258-286.

An approximate theory is described which takes into account the influence of the wake on the aerodynamic derivatives of an oscillating rotor blade. It is shown that the most important parameter is the number of cycles of the oscillation which occur during one revolution of the rotor. The flutter characteristics of a simple rotor blade are calculated on the basis of this theory, and it is found that the wake causes radical changes in the critical speeds.

14105 Higher Harmonic Rotor Control. P. R. Payne. *Aircraft Engineering*, v. 30, Aug. 1958, p. 222-226.

The elimination of the retreating blade stall speed limitation for helicopters by means of an appropriately programmed feathering input is studied for the general case of a rigid flapping blade with hinge constraint.

14106 Definitions of Damping in Aircraft Response. T. Czaykowski. *Aircraft Engineering*, v. 30, Aug. 1958, p. 227-232.

Proposes a new definition of damping in oscillatory modes and suggests that it offers certain advantages to both the theoretical and the practical worker.

14107* The Way to Missile Reliability. Eric Burgess. *Astronautics*, v. 3, Aug. 1958, p. 36 + 3 pages.

Suggests bringing the many components of a weapon system together for rigorous testing in one "single-roof" facility.

14108 WADC Explores Lunar Probe Control. *Aviation Week*, v. 69, July 28, 1958, p. 37-39.

A novel technique for determining velocity and direction of a circumlunar vehicle. Braking ellipse approach requires extremely precise control of the vehicle injection angle or velocity at launch, but requires vastly less fuel, hence far lower vehicle gross wight, than use of retro-rockets to decelerate vehicle.

14109 Danger in the Air. Oliver Stewart. 194 pp. 1958. Philosophical Library, New York. (TL553.5 St49d)

Describes and comments upon a set of air accidents, each one illustrating some particular kind of danger, and shows how it has been dealt with by engineers, designers, and research workers.

14110 Hearings Before the Select Committee on Astronautics and Space Exploration. Eighty-Fifth Congress, Second Session on H.R. 11881. 1958. U. S. Government Printing Office, Washington. D. C. (TL790 Un3.31a)

Verbatim statements of the participants, together with supporting documents on establishment of the N.A.S.A.

14111 On Optimum Thin Lifting Surfaces at Supersonic Speeds. H. Yoshihara, J. Kainer, and T. Strand. *Journal of the Aero/Space Sciences*, v. 25, Aug. 1958, p. 473 + 7 pages.

Supersonic interference between lifting elemnets of a wing surface is investigated. With the usual linearized supersonic theory, wings of given plan form and zero thickness are derived

which have minimum drag for prescribed values of lift and pitching moment. The required wing twist and camber are represented as a summation of ten quasi-conical expressions, and the coefficients of this series are determined by the usual calculus of variations.

14112 Angle of Attack Convergence of a Spinning Missile Descending Through the Atmosphere. Herman I. Leon. *Journal of the Aero/Space Sciences*, v. 25, Aug. 1958, p. 480-484.

In many missile designs, aerodynamic damping is negligible at altitudes above that for maximum heating. In addition, variations in velocity and flight path angle are small. Utilizing these approximations, the angular motion of a spinning missile through an exponential atmosphere is derived for small angles of attack.

14113 The Supersonic Blunt-Body Problem—Review and Extension. Milton D. Van Dyke. *Journal of the Aero/Space Sciences*, v. 25, Aug. 1958, p. 485-496.

A survey of existing analytical treatments of the supersonic or hypersonic blunt-body problem indicates that none is adequate for predicting the details of the flow field. Reasons are given for the failure of various plausible approximations. A numerical method, which is simpler than others proposed, is set forth for solving the full inviscid equations using a medium-sized electronic computer. Results are shown from a number of solutions for bodies that support detached shock waves described by conic sections.

14114 Buckling Phenomena of Stiffened Panels. Syed Yusuff. *Journal of the Aero/Space Sciences*, v. 25, Aug. 1958, p. 507-514.

An investigation of the instabilities involved in the design of stiffened panels forming compression surfaces is presented. An extensive analysis of test panels is carried out; these panels cover a wide range of configurations required to satisfy wing loadings typical of modern aircraft. Tabulated results of the analysis and charts to determine critical stresses are offered as a guide to design.

14115 Man Into Space. New Projects for Rocket and Space Travel. Hermann Oberth. (Translated from the German by G. P. H. Freville.) 232 pp. 1957. Harper & Brothers, New York. (TL790 Ob2mtr)

Presents the author's theories about the earth satellite, space stations, space suits, and equipment to be used by explorers. Describes spaceships to be powered by electricity derived from the sun, observatories to be installed on asteroids, vehicles for use in exploring the moon, and special problems of space travel in popular readable form.

14116* (English.) **Flow Formation With Suction or Injection.** R. S. Nanda. *Physical Society of Japan, Journal*, v. 13, July 1958, p. 748-753.

The problem of boundary layer control with suction or injection is discussed for flow between two planes at a finite distance apart, and in the annular space between two concentric circular cylinders. Exact solutions of the full Navier-Stokes equations are obtained in both cases.

14117 Principles of Guided Missile Design. v. IV. Missile Engineering Handbook. C. W. Besserer. 600 pp. 1958. D. Van Nostrand, New York. (UG630 M55p)

A handbook on guided missiles and space flight with equations, formulas, graphs, and tables for preliminary designs and parametric studies important in weapon system analysis.

14118* Automatic Flight—The British Story. G. W. H. Gardner. *Royal Aeronautical Society, Journal*, v. 62, July 1958, p. 477-495.

A lecture covering the history of controlled flight.

14119* Semi-Empirical Methods of Estimating Forces on Bodies at Supersonic Speeds. J. E. Phythian and R. L. Dommett. *Royal Aeronautical Society, Journal*, v. 62, July 1958, p. 520-524.

Accuracy of data for zero incidence and high incidence is evaluated.

14120* Flight Tests of a Meteor Aeroplane Fitted With Jet Deflection. P. F. Ashwood and D. Lean. *Royal Aeronautical Society, Journal*, v. 62, Aug. 1958, p. 539-561.

14121* Our Best Weapon System Today. Yngve Norrvi. *Saab Sonics*, 1958, no. 26, p. 11-17.

Describes the Swedish Lansen Saab-32A attack aircraft.

14122* (Romanian.) Aerodynamic Characteristics of Jet Flap Profiles. **Caracteristicle aerodinamice ale profilelor cu volet fluid.** N. N. Patraulea, L. Dumitrescu, and D. Căprită. *Studii şi Cercetări de Mecanică Aplicată*, v. 9, no. 1, 1958, p. 13-41.

Analyzes turbulence phenomena in the airflow around a jet flap profile in the case of a linear profile and a profile with wing flap. Aerodynamic moments and position of center of pressure are computed for the two profiles.

14123 Vistas in Astronautics. First Annual Air Force Office of Scientific Research Astronautics Symposium. Morton Alperin, Marvin Stern, and Harold Wooster, editors. 330 pp. 1958. Pergamon Press, New York. (TL787 As89s)

Symposium objectives were to survey the scientific and technological progress of astronautics, and to indicate the lines of research which need be emphasized to facilitate future space exploration. Forty-four papers on as many phases of investigation were presented.

14124* (English.) **Unsteady Flow Through Helicopter Rotors.** Holt Ashley, Eugene Brunelle, and Herbert H. Moser. *Zeitschrift für Angewandte Mathematik und Physik*, v. 9b, nos. 5/6, Mar. 17, 1958, p. 57-80.

Tentative conclusions are drawn concerning rotor vibrations and unsteady flow. Unsteady effects are accounted for, with particular reference to the shed vortices in the helical wake.

14125* (English.) **On the Aerodynamic Heating of Blunt Bodies.** Edward R. Van Driest. *Zeitschrift für Angewandte Mathematik und Physik*, v. 9b, nos. 5/6, Mar. 17, 1958, p. 233-248.

Criterion for minimum transition Reynolds number. Mass transfer as a means of alleviating turbulent heating.

See also: **14722** (propulsion systems); **15235** (fiber-polymer materials in space vehicles); **15301** (rubber in space flight); **15330** (brazed missile components).

AGRICULTURE

14126* The Ecology of the Fungi. Wm. Bridge Cooke. *Botanical Review*, v. 24, no. 6, June 1958, p. 342-429.

14127* The Industrial Utilization of Yeasts. Cecil G. Dunn. *Economic Botany*, v. 12, Apr.-June 1958, p. 145-163.

14128* The Natural History of Jojoba (*Simmondsia chinensis*) and Its Cultural Aspects. Howard Scott Gentry. *Economic Botany*, v. 12, July-Sept. 1958, p. 261-295.

The large edible seeds contain about 50% oil, which is a liquid wax. Hydrogenation converts it to a hard white wax.

14129* Industrial Raw Materials of Plant Origin. IV. A Survey of *Simmondsia chinensis* (Jojoba). P. M. Daugherty, H. H. Sineath, and T. A. Wastler. *Economic Botany*, v. 12, July-Sept. 1958, p. 296-304.

14130* (German.) Investigations to Improve Precipitation of Plant Protectives by Means of Electrical Charges. **Untersuchungen zur Verbesserung der Niederschläge von Pflanzenschutzmitteln durch elektrostatische Aufladung.** Horst Göhlich. *Forschung auf dem Gebiete des Ingenieurwesens* (Ausgabe B), v. 24, no. 467, 1958, 32 pp.

Charging results in a considerably better distribution of particles and in a two to threefold increased precipitation. Further advantages result from reduced dispersion of the particles and in a stronger adherance of dust particles to the plant surfaces.

14131 The Growth of Leaves. Proceedings of the Third Easter School in Agricultural Science, University of Nottingham, 1956. F. L. Milthorpe, editor. 223 pp. 1956. Butterworths Scientific Publications, London. (QK731 N84.82g)

A series of papers on growth and differentiation, initiation of leaf primordia, leaf expansion, and influence of external forces on leaf growth.

14132 Pesticide Development Costs. Charles O. Barnard. *Journal of Agricultural and Food Chemistry*, v. 6, July 1958, p. 512-513.

A survey of the cost of developing a new pesticide reveals outlays of from $750,000 to $3.25 million.

14133 Insect Attractants. Esters of 6-Methyl-3-Cyclohexene-1-Carboxylic Acid as Attractants for the Mediterranean Fruit Fly. S. I. Gertler, L. F. Steiner, W. C. Mitchell, and W. F. Barthel. *Journal of Agricultural and Food Chemistry*, v. 6, Aug. 1958, p. 592-594.

Approximately one-fourth of the esters showed considerable attractiveness to the male of this species when tested by the olfactometer method. The most effective compounds in the field tests were esters of secondary alcohols with short chains, not exceeding five carbons.

14134 Insecticide Residues. Demeton Residues in Collards, Lettuce, and Mustard. C. H. Van Middelem and R. E. Waites. *Journal of Agricultural and Food Chemistry*, v. 6, Aug. 1958, p. 594-597.

The usually recommended 21-day waiting period following the last application was inadequate when three or four foliar applications (4-oz. active) were applied once per week. The Miller Bill tolerance of 0.75 p.p.m. (established on lettuce) can be met on all three of these leafy vegetables if foliar applications, using recommended dosages, are spaced 2 to 3 weeks apart and a 21-day waiting period following the last application is allowed before harvest.

14135* The Absorption and Distribution of Strontium in Plants. I. Preliminary Studies in Water Culture. R. Scott Russell and Helen M. Squire. *Journal of Experimental Botany*, v. 9, no. 26, June 1958, p. 262-276.

Very little redistribution of Sr occurred within the plant. Leaves which developed after treatment in the labeled solutions contained little or no Sr even when the concentration in the older leaves was very high. Strontium was initially retained in the nodes of the stems, but the greatest accumulation was later found to be in the leaves which had been growing most actively at the time of absorption.

14136* The Nuclear Incorporation of Iron and Its Significance in Growth. J. V. Possingham and R. Brown. *Journal of Experimental Botany*, v. 9, no. 26, June 1958, p. 277-284.

14137* The Heat Pulse Method for Measuring Rate of Sap Flow in a Plant Stem. R. L. Closs. *New Zealand Journal of Science*, v. 1, no. 2, June 1958, p. 281-288.

The method consists of injecting heat into the stem of a plant and measuring the time it takes to reach a point farther up the stem.

14138 Plant Protection Conference 1956. Proceedings of the Second International Conference at Fernhurst Research Station, England. 315 p. 1957. Academic Press Inc., New York. (SB599 P69p)

Genetics in relation to crop protection; the physiology of immunity; mechanism of toxicity of insecticides and fungicides; systemic insecticides; systemic fungicides and bactericides; residues from pesticides in foodstuffs; residual effects of crop-protection chemicals in the soil.

See also: **14740** (botanical library).

BIOCHEMISTRY AND BIOPHYSICS

14139* (English.) **Malignant Disease in Autopsies, 1913-1954.** Magne Grimstvedt and Erik Waaler. *Acta Pathologica et Microbiologica Scandinavica*, v. 43, no. 3, 1958, p. 225-240.

14140* (English.) **On the Chromosome Number of Human Sternal Marrow.** Lis Elmholt. *Acta Pathologica et Microbiologica Scandinavica*, v. 43, no. 3, 1958, p. 241-246.

Describes a special preparation and squash technique used to count and identify chromosomes in human sternal marrow.

14141* (English.) **Destruction of Some Agglutinins But Not of Others by Two Sulfhydryl Compounds.** R. Grubb and B. Swahn. *Acta Pathologica et Microbiologica Scandinavica*, v. 43, no. 3, 1958, p. 305-309.

Mercaptoethanol and ethylmercaptan in fairly low concentrations abolish the ordinary serological manifestation of anti-A and anti-B, complete anti-Rh, cold agglutinins, Paul-Bunnell antibody and the rheumatoid arthritic factor. Under the same conditions human incomplete anti-Rh and some rabbit antibodies are hardly affected.

14142* (English.) **An Experimental Investigation of Methods for the Cultivation of *Mycobacterium tuberculosis* From Sputum.** Rolf Saxholm. *Acta Pathologica et Microbiologica Scandinavica, Supplementum* 126, 1958, 148 pp.

The muco-lytic enzyme-quaternary ammonium compound method for cultivation of tubercle bacilli was tested. It gives a larger yield of tubercle bacilli than the sodium hydroxide method, as well as earlier and more luxuriant growth.

14143 Advances in Geneties. M. Demerec, editor. v. IX. 294 pp. 1958. Academic Press, New York. (QH301 Ad95 Vis.)

Population genetics of *Drosophila robusta*; genetics of Basidiomycetes; genetic analysis based on mitotic recombination; an 8-chromosome map of *Aspergillus nidulans*; inviability, weakness, and sterility of interspecific hybrids; the mechanism of sex determination in dioecious flowering plants.

14144* (Russian.) Inherited Information and Its Transformation. **Nasledstvennaia informatsiia i ee preobrazovahiia.** I. I. Shmal'ganzen. *Akademiia Nauk SSSR, Doklady*, v. 120, no. 1, May-June, 1958, p. 187-190.

A model of the mechanism of evolution.

14145* (Russian.) Regeneration of Dog's Tooth Tissue. **O regeneratsii tkani zuba u sobak.** L. V. Polezhaev, A. I. Matveeva, and V. I. Vorob'eva. *Akademiia Nauk SSSR, Doklady*, v. 120, no. 1, May-June 1958, p. 212-215 + 1 plate.

14146* (Ukranian.) Significance of Chronic Inflammation for the Growth and Dissemination of Experimental Cancer. **Vpliv khronichnogo zapal'nogo protsesu na rist ta metastazuvannia eksperimental'nogo raka.** M. D. Podil'chak. *Akademiia Nauk Ukrains'koi RSR, Dopovidi*, 1958, no. 6, p. 675-677.

Induced chronic inflammation in the gall bladder or vesica urinaria of rabbits increased metastases of Brown-Pearce tumor.

14147* The Histogenesis of Antibody-Producing Intraocular Transplants of Thymus in Mice. William L. Williams, William M. Hale, and Richard D. Stoner. *AMA Archives of Pathology*, v. 66, Aug. 1958, p. 225-233.

The transplant at the time the antigen is given is shown to consist of three cell types: rounded metallophilic, rod-shaped metallophilic, and primitive nonmetallophilic cells. One or more of these cell types is capable of responding to tetanus toxoid, as evidenced by the production of antitoxin.

14148* Evolution by Mutation. H. J. Muller. *American Mathematical Society, Bulletin*, v. 64, no. 4, July 1958, p. 137-160.

14149* Induction of a Lysogenic *Escherichia coli* With Alpha and Deuteron Particles. Harry P. Rappaport. *Archives of Biochemistry and Biophysics*, v. 76, no. 1, July 1958, p. 1-14.

Alpha and deuteron particles can induce a lysogenic strain of *E. coli*. The cross section for induction correlates with the number of nuclear bodies in the cell. Cells that have been killed by ionizing radiation can still be induced. On the basis of target theory a thin (50 A) physical structure with cross section 8×10^{-10} sq. cm. for long phase cultures is deduced as the carrier of the constraint against phage synthesis.

14150* Mechanism of Inhibition of Catalse by 3-Amino-1,2,4-triazole. Robert N. Feinstein, Sara Berliner, and Frank O. Green. *Archives of Biochemistry and Biophysics*, v. 76, no. 1, July 1958, p. 32-44.

Injection of 3-amino-1,2,4-triazole (AT) reduces the catalase activity of six solid tissues in the same order as does the implantation of a tumor. *In vitro*, dilute AT, in combination with a widely distributed heat-stable factor (HSF), reduces the activity of crystalline catalase. Alcohol-treated HSF prevents catalase inhibition by an otherwise active HSF-AT system.

14151* Chromatographic Studies of Purine Metabolism. II. The Mechanism of *E. coli* Inhibition by A-Methopterin. Arthur J. Tomisek, Harold J. Kelly, Mary R. Reid, and Howard E. Skipper. *Archives of Biochemistry and Biophysics*, v. 76, no. 1, July 1958, p. 45-55.

The observed effect of A-methopterin upon *Escherichia coli* metabolism has been the intracellular accumulation of 5-amino-4-imidazolecarboxamide ribotide, with the concomitant exclusion of formate-C^{14} and glycine-C^{14} from purine derivatives. The metabolic sequence from formate to the various purine ribotides was apparently the same for an A-methopterin-resistant strain of *E. coli* as for its parent strain.

14152* The Mechanism of Chemical Mutagenesis. II. Interactions of Selected Compounds With Manganous Chloride. Irvin D. Steinman, Venkatram N. Iyer, and Waclaw Szybalski. *Archives of Biochemistry and Biophysics*, v. 76, no. 1, July 1958, p. 78-86.

Interactions between $MnCl_2$ and other mutagens, assessed by measuring changes in mutation rates from streptomycin-dependence (sd-4) to independence, and from cysteine-requirement (cys-2) to prototrophy in *E. coli*, Sd-4-73, varied from highly synergistic to less than additive (antagonistic).

14153* Spectrophotometric and Stoichiometric Titrations of Ribonuclease in Eight Molar Urea. Olga O. Blumenfeld and Milton Levy. *Archives of Biochemistry and Biophysics*, v. 76, no. 1, July 1958, p. 97-102.

Stoichiometric and spectrophotometric titration curves of ribonuclease in 8 *M* urea indicate that the six tyrosyl hydroxyls are equally capable of dissociating H ions and follow a monotonic titration curve with $pK_{(int)}$ of 10.67 and $w = 0.018$. Since ribonuclease is active in 8 *M* urea solution, the structure involved in H bonding of the tyrosyl hydroxyls is not essential to enzyme action.

14154* Absorption Spectrum of the Peptide Bond: Basic Properties of Peptides and Proteins. A. R. Goldfarb, E. Hoffmann, and N. Gutstein. *Archives of Biochemistry and Biophysics*, v. 76, no. 1, July 1958, p. 161-167.

The basicity of a series of peptides and proteins has been determined in the sulfuric acid system and in acetic acid. The values of pK_a all fall in a narrow range of values. The relation between these findings and the theory of energy transfer by peptide bonds is considered.

14155* Effect of 8-Azaguanine on Utilization of Methionine by *B. cereus*. H. George Mandel. Archives of Biochemistry and Biophysics, v. 76, no. 1, July 1958, p. 230-232.

It would appear that the over-all composition of protein from bacterial cells grown in the presence of 8-azaguanine differs sharply from that of control microorganisms, particularly in sulfur content, and the possibility exists that the drug's actions are related to an altered pattern of protein synthesis, resulting from the incorporation of the drug into a cofactor molecule.

14156 Biochemical Cytology. Jean Brachet. 516 pp. 1957. Academic Press, New York. (QH581 B72b)

Presents an integrated version of the known facts about the morphology and the biochemistry of the cell. It is written for the reader who already knows the fundamentals of descriptive cytology, biochemistry, embryology, and genetics. Includes chapters on techniques, cytoplasm of the resting cell, the nucleus of the resting cell, mitosis, nucleic acids in heredity and protein synthesis, nucleocytoplasmic interactions in unicellular organisms, and the nucleus and cytoplasm in embryonic differentiation.

14157* (English.) **On the Mechanism of the Synthesis of Virus Nucleic Acid.** Matthys Staehelin. *Biochimica et Biophysica Acta*, v. 29, no. 1, July 1958, p. 43-46.

The incorporation of P^{32} into the nucleic acid of tobacco-mosaic and turnip-yellow mosaic virus is studied by degradation of the RNA to 5'-nucleotides with snake-venom phosphodiesterase and to 2'- and 3'-nucleotides with alkali. It is concluded that the nucleic acid of these viruses is synthesized from 5'-nucleotides and that there is no quantitatively preferential attachment of one nucleotide to another. The differences within the purine and pyrimidine nucleotides suggest that the 5'-nucleotides are not formed from common phosphate containing precursors.

14158* (English.) **The Nucleic Acid Metabolism of Animal Cells *In Vitro*. I. The Incorporation of ^{14}C-Formate.** R. M. S. Smellie, R. Y. Thomson, and J. N. Davidson. *Biochimica et Biophysica Acta*, v. 29, no. 1, July 1958, p. 59-74.

In vivo, the tissues studied incorporate ^{14}C-formate extensively into their nucleic acid purines and DNA thymine. *In vitro* in most of the tissues studied, and particularly in the Ehrlich ascites tumour of the mouse, incorporation into nucleic acid purines is depressed although incorporation into DNA thymine remains high. However, in chick embryo liver and rat liver regenerating after partial hepatectomy, the pattern of incorporation *in vivo* is the same as *in vitro*. In the Ehrlich ascites carcinoma *in vitro* incorporation into nucleic acid purines is greatly increased by addition of 5-amino-4-imidazole carboxamide and its riboside or of a particle-free extract of mouse liver.

14159* (English.) **Theoretical Studies on the Interaction of Synthetic Polyribonucleotides.** Gary Felsenfeld. *Biochimica et Biophysica Acta*, v. 29, no. 1, July 1958, p. 133-144.

In the interaction of polyadenylic acid with polyuridylic acid to form a two-stranded poly (A + U) complex, the only model for which the predicted results are consistent with the observed results is one involving the reversible formation of the poly (A + U) structure. The possibility that the interaction is irreversible, so that large numbers of binding sites on poly A and poly U are unoccupied, is eliminated.

14160* (English.) **Interrelations Between Nucleic Acid and Protein Syntheses in *Lactobacillus acidophilus*.** Tuneko Okazaki and Reiji Okazaki. *Biochimica et Biophysica Acta*, v. 29, no. 1, July 1958, p. 211-212.

Experiments were carried out on the effects of separate depletion of deoxyriboside, uracil or amino acids on DNA, RNA, and protein syntheses and on the amount of acid-soluble compounds.

14161* (English.) **On the Use of Chloramphenicol—Inhibited Systems for Investigating RNA and Protein Synthesis.** A. I. Aronson and S. Spiegelman. *Biochimica et Biophysica Acta*, v. 29, no. 1, July 1958, p. 214-215.

Results support the hypothesis that chloramphenicol acts by blocking the conversion of the unstable RNA polymer to a stable ribonucleoprotein.

14162* (English.) **Effect of 5-Fluorouracil on a Uracil-Requiring Mutant of *Escherichia coli*.** Jack Horowitz, Jussi J. Saukkonen, and Erwin Chargaff. *Biochimica et Biophysica Acta*, v. 29, no. 1, July 1958, p. 222-223.

There was a 100% increase in protein after 3 hr. in the culture containing FU. During this time, the increase in RNA amounted to only 10-15%, while the DNA content decreased in the course of the treatment, sometimes as much as 25-30%. Concentrations of FU ranging from 1-100 μg/ml. gave similar results.

14163* (English.) **Studies on the Mechanism of Action of 6-Azauracil.** Yasuyuki Takagi and Nozomu Otsuji. *Biochimica et Biophysica Acta*, v. 29, no. 1, July 1958, p. 227-228.

AzU in concentrations as high as 500 μg/ml. did not affect enzyme formation in intact cells. On the other hand, addition of even a very low concentration of this compound to either protoplast or lysed-protoplast preparations produced a block in tryptophanase synthesis. This inhibition can be achieved even if AzU is added after the inducer, at a time when enzyme formation has already occurred.

14164 Biological Ultrastructure. Arne Engström and J. B. Finean. 326 pp. 1958. Academic Press, New York. (QH611 En37b)

Methods in ultrastructural research, principles of molecular structure, role of proteins, lipids, carbohydrates, nucleic acids, mineral salts, and role of ultrastructure in biology and medicine.

14165* Effect of Chemical Protection and Bone Marrow Treatment on Radiation Injury in Mice. Paul Urso, C. C. Congdon, D. G. Doherty, and Raymond Shapira. *Blood*, v. 13, July 1958, p. 665-676.

Combined treatment with MEG (2 mercaptoethylguanidine·HBr) and isologous bone marrow of mice exposed to 900 r of X-rays demonstrated that MEG is primarily responsible for preventing the early destruction of the bone marrow, but bone marrow injection was primarily responsible for causing a more rapid recovery of the bone marrow.

14166* The Effects of Components of Guinea Pig Serum on Lymphosarcoma 6C3HED in C3H Mice. Peter A. Herbut, William H. Kraemer, and Louis Pillemer. *Blood*, v. 13, Aug. 1958, p. 732-739.

Complete regression of tumor as well as marked retardation of growth were noted as a result of treatment with the sera. Results indicate that the tumor inhibitory principle (TIP) in guinea pig serum is probably not complement, properdin, or lipopolysaccharide.

14167* The Polysaccharide Behaviour of Cancer Antigens. Jack G. Makari. *British Medical Journal*, no. 5092, Aug. 9, 1958, p. 355-358.

Substances distinctly polysaccharide-like in nature have been prepared from cancer and normal tissue antigens by two procedures: by precipitation with isopropyl alcohol and deproteinization with chloroform and butyl alcohol; by heat and alkali treatment. The specific immunological activity of cancer antigens seems to reside in these polysaccharide-like substances.

14168* Detection of Antigens in Sera of Patients With Neoplastic Disease by Schultz-Dale Test. Its Possible Use as a Screening Procedure for Tumours. Jack G. Makari. *British Medical Journal*, no. 5092, Aug. 9, 1958, p. 358-361.

The Schultz-Dale test has been modified by immunizing guinea-pigs with carcinoma sediment obtained between 3,000 and 10,000 r.p.m. instead of 3,200 to 4,000 r.p.m. This modification has been studied in 566 individuals and 704 serum specimens obtained from blood-bank sera. This modification can be useful as a tumor-screening procedure, while the original method would serve as a specific diagnostic test for carcinoma.

14169 The Presence of a Mitosis Inhibitor in the Serum and Liver of Adult Rats. H. F. Stich and M. L. Florian. *Canadian Journal of Biochemistry and Physiology*, v. 36, no. 8, Aug. 1958, p. 855-859.

The influence of serum and tissue homogenates on the mitotic rate of regenerating liver suggest the presence of an organ-specific inhibitor of mitosis.

14170* The Effect of Long Term Administration of Prednisolone and Growth Hormone on the Growth of Transplanted Mammary Adenocarcinoma in C_3H Mice. Rex N. MacAlpin, Sidney M. Blair, Donald R. Gillies, William R. Lyons, and Choh Hao Li. *Cancer*, v. 11, no. 4, July-Aug. 1958, p. 731-736.

Intact virgin C_3H mice bearing transplanted mammary adenocarcinomas were treated with prednisolone, prednisolone plus somatotrophic hormone (STH), or STH alone. Prednisolone alone inhibited the growth of the transplanted tumor and increased the time of survival. Addition of STH to prednisolone apparently inhibited the tumor slightly more than did prednisolone alone, but did not further increase survival.

14171* The Present Potential of Exfoliative Cytology in the Detection of Cervix Cancer. John W. Berg and Genevieve M. Bader. *Cancer*, v. 11, no. 4, July-Aug. 1958, p. 758-764.

Exfoliative cytology utilizing direct cervical smears was the primary means of detection for 91% of the cancers found. Concludes that when cervical cytology is included in an annual examination of cancer-free women, deaths from cervix cancer should be almost wholly preventable.

14172* Cellular Metabolism and Cancer: a Review. Saul Kit and A. Clark Griffin. *Cancer Research*, v. 18, no. 6, July 1958, p. 621-656.

14173* The Effect of Croton Oil and Carcinogens on Mitosis and the Deoxyribonucleic Acid Content of Cervical Epithelial Cells. D. G. Scarpelli and Emmerich von Haam. *Cancer Research*, v. 18, no. 6, July 1958, p. 657-663.

A correlation exists between increased nuclear DNA and augmented mitoses, or mitotic rate. Marked increases in the mitotic rate and nuclear DNA (polyploidy) were observed in many malignant cells.

14174* Tumor Production in X-Ray- and Cortisone-Treated Rats Given Injections of Human Cells in Continous Cultivation. J. Fogh and K. A. Hok. *Cancer Research*, v. 18, no. 6, July 1958, p. 692-697 + 1 page.

Regression of tumors was observed for all tissue culture strains. No metastases were seen. Cells derived from tumors could be established in tissue culture and showed characteristics of the original cells. Attempts to establish tumors in nonirradiated rats were negative.

14175* The Relative Ability of Cell-Free Fractions of the Transplantable Human Tumor, H.Ep #3, to Produce H. Ep #3 Cytotoxins in Rats. Helene Wallace Toolan and Robin A. Wallace. *Cancer Research*, v. 18, no. 6, July 1958, p. 698-705 + 1 plate.

Antigenic activity lay in those fractions of the tumor cell which contained vesicles and fragments of endoplasmic reticulum.

14176* Use of the Housefly as a Screening Agent for Tumor-Inhibiting Agents. Norman Mitlin and Anne M. Baroody. *Cancer Research*, v. 18, no. 6, July 1958, p. 708-710 + 1 page.

Twenty-six growth-inhibiting compounds used in a study reported by Gellhorn and Hirschberg (1955) on diverse biological systems were tested on the housefly to determine whether that organism could be used for screening potential tumor-inhibiting drugs. Growth of the ovaries was used as a criterion. Fifteen of the materials caused inhibition of ovarian growth.

14177* Some Practical Aspects of Storing Mammalian Cells in the Dry-Ice Chest. H. E. Swim, R. F. Haff, and R. F. Parker. *Cancer Research*, v. 18, no. 6, July 1958, p. 711-717.

A variety of cultured mammalian cells, including both permanent strains and newly isolated lines derived from several species and with diverse histories have been stored successfully at −70 C for periods of at least three years.

14178 Cellular Biology. Nucleic Acids and Viruses. Otto V. St. Whitelock, editor in chief. v. V. 414 pp. 1957. New York Academy of Sciences, New York. (QH581 N42c Over.)

A series of papers concerned with the aspects of poliomyelitis; nucleic acids; properties acquired by cells maintained in continuous culture; role of tissue cultures in the isolation and study of viruses.

14179 Anti-Radioactivity Drug. "Radical Trap" Action Neutralizes Free Radicals Produced by Radiation. *Chemical and Engineering News*, v. 36, no. 34, Aug. 25, 1958, p. 23.

The compound S,2-aminoethylisothiuronium bromide hydrobromide (AET) appears to localize in bone marrow and rearranges to mercaptoethylguanidine (MEG) which "neutralizes" free radicals released by the ionization of water. AET is less toxic than MEG and higher dose rates are possible which reduce radiation damage by a half.

14180 Naturally Occurring Acid-Soluble Nucleotides. J. Frank Henderson and G. A. LePage. *Chemical Reviews*, v. 58, no. 4, Aug. 1958, p. 645-688.

Nomenclature; methods; nucleotides of adenine, uracil, guanine, cytosine, thymine, and their derivatives.

14181* Chemistry of Some Newer Antibiotics. N. G. Brink and R. E. Harman. *Chemical Society, Quarterly Reviews*, v. 12, no. 2, 1958, p. 93-115.

The macrolide antibiotics; magnamycin; methymycin; *neo*-methymycin; pikromycin; erythromycin; other macrolide antibiotics; novobiocin; antifungal antibiotics; anti-tumor antibiotics; actinomycins; azaserine; 6-diazo-5-oxo-L-norleucine (DON); alazopeptin; sarkomycin; puromycin; and other nucleoside antibiotics.

14182* Recent Developments in the Biochemistry of Nucleotide Coenzymes. J. Baddiley and J. G. Buchanan. *Chemical Society, Quarterly Reviews*, v. 12, no. 2, 1958, p. 152-172.

14183 Cholesterol. Chemistry, Biochemistry, and Pathology. Robert P. Cook, editor. 542 pp. 1958. Academic Press, New York. (QP801.C5 C77c)

Methods of isolation and estimation of sterols, distribution of sterols in organisms and in tissues, and cholesterol metabolism and its various manifestations.

14184* (French.) Display of the Epiphysis-Hypophysis Antagonism by Means of Grafts on Ovary of the Female Rat Under the Age of Puberty. **Mise en évidence, par les greffes sur l'ovaire de la Ratte impubère, de l'antagonisme épiphyso-hypophysaire.** Anne Moszkowska. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 26, June 30, 1958, p. 3685-3687.

A prehypophysis of an adult male rat grafted on the ovary caused the appearance of early puberty. The association of four rat epiphyses with the prehypophysis decreased this gonadotropic effect.

14185 Steroid Research. II. How to Win at Structural Roulette. Norman Applezweig. *Drug and Cosmetic Industry*, v. 83, no. 1, July 1958, p. 36 + 7 pages.

14186 Further Studies on the Deoxyribonucleic Acid of the Bacteriophage D_4 of *Salmonella enteritidis*. E. Barbu, M. Joly, A. B. Robins, and K. V. Shooter. *Faraday Society, Transactions*, v. 54, pt. 7, July 1958, p. 1092-1096.

The DNA particles are considerably larger than those of calf thymus DNA, and less heterogeneous than calf thymus DNA.

14187* Phenotypic Properties of Heterozygotes in the Bacteriophage T4. R. S. Edgar. *Genetics*, v. 43, no. 2, Mar. 1958, p. 235-248.

14188* Factors Limiting the Number of Radiation-Induced Chromosome Exchanges. I. Distance: Evidence From Non-Interaction of X-Ray- and Neutron-Induced Breaks. Sheldon Wolff, K. C. Atwood, M. L. Randolph, and H. E. Luippold. *Journal of Biophysical and Biochemical Cytology*, v. 4, no. 4, July 1958, p. 365-372.

Soaked seeds of *Vicia faba* were exposed to fractionated doses of X-rays or X-rays and fast neutrons. When the two-hit (exchange) chromosome aberrations were scored at the first mitosis of the root tip, it was observed that with short fractionation times the radiation-induced breaks from the two X-ray doses could rejoin with one another to form exchanges in proportion to the square of the total dose. If, however, one dose was X-rays and the second neutrons, then no quantitatively determinable interaction occurred between the breaks induced by each of the doses, and the aberration yield was simply the sum of that induced by each fraction.

14189* The Localization of Deoxyribonucleic Acid in *Escherichia coli*. Lucien G. Caro, Robert P. Van Tubergen, and Frederick Forro, Jr. *Journal of Biophysical and Biochemical Cytology*, v. 4, no. 4, July 1958, p. 491-494 + 1 plate.

Thin sections of *E. coli* 15 T- grown in a medium containing tritium-labelled thymidine were radio-autographed. The label was found to occupy the same position as the "nuclear region" seen in electron micrographs of these cells.

14190* Electron Micrographs of Myelin Figures of Phospholipide Simulating Intracellular Membranes. Jean Paul Revel, Susumu Ito, and Don W. Fawcett. *Journal of Biophysical and Biochemical Cytology*, v. 4 ,no. 4, July 1958, p. 495-496.

14191* Nitrogen Metabolism, Respiration, and Growth of Cultured Plant Tissue. IV. The Impact of Growth on Protein Metabolism and Respiration of Carrot Tissue Explants. General Discussion of Results. F. C. Steward and R. G. S. Bidwell. *Journal of Experimental Botany*, v. 9, no. 26, June 1958, p. 285-305.

14192* Studies on the Antigenicity of β- and α_1-Lipoproteins of Human Serum. Angelo Scanu, Lena A. Lewis, and Irvine H. Page. *Journal of Experimental Medicine*, v. 108, Aug. 1958, p. 185-196.

Delipidation did not affect the antigenicity of either β- or α_1-lipoproteins.

14193* Gamma Globulins in Germ-Free Rats. Bengt E. Gustafsson and Carl-Bertil Laurell. *Journal of Experimental Medicine*, v. 108, Aug. 1958, p. 251-258.

Germ-free animals had significantly lower concentrations of β and the γ globulins, while the other fractions were within normal limits. Assuming that the γ globulins survive equally long in the circulation in germ-free animals as in controls, the production of γ globulins in normal rats is three times as rapid as in germ-free rats.

14194* Genetics of Somatic Mammalian Cells. II. Chromosomal Constitution of Cells in Tissue Culture. J. H. Tjio and Theodore T. Puck. *Journal of Experimental Medicine*, v. 108, Aug. 1958, p. 259-268 + 2 plates.

Describes a method for chromosome delineation of animal cells grown as monolayers on glass. Tissue cultured cells from five different, normal organs of seven different human subjects uniformly displayed the expected chromosome number of 46 and showed no variations in morphology or number other than the expected sex differences and a small incidence of polyploidy. The chromosome number and morphology of cells from normal human tissues remained constant during more than five months of continuous, rapid growth in tissue culture.

14195* Concerning the Cytopathogenic Effect of Poliovirus; Evidence for an Extraviral Toxin. W. Wilbur Ackermann, Francis E. Payne, and Hilda Kurtz. *Journal of Immunology*, v. 81, no. 1, July 1958, p. 1-6.

A toxic effect of fluids obtained from tissue cultures infected with type 1 poliovirus was observed when the fluids were introduced into fresh cultures. The ability to destroy cells and give rise to detectable amounts of toxin is a characteristic of only certain lines of the poliovirus.

14196 Electron Spin Resonance Studies of Radiation Damage to Peptides. Gene McCormick and Walter Gordy. *Journal of Physical Chemistry*, v. 62, July 1958, p. 783-789.

Pattern were generally found to be different for different peptides and also different in most instances from those obtained by X-irradiation of their constituent amino acids.

14197* The Role of Endogenous Pyrogen in the Genesis of Fever. W. Barry Wood, Jr. *Lancet*, v. 2, July 12, 1958, p. 53-56.

Endogenous pyrogen derived from polymorphonuclear leucocytes in inflammatory exudates plays a central role in the pathogenesis of many kinds of fever. Leucocytes in granulocytic exudates release the endogenous pyrogen into the surrounding medium while still functionally active. As endogenous pyrogen indistinguishable from leucocytic pyrogen has likewise been detected in the sera of rabbits with pyrexia resulting from acute streptococcal cellulitis, from tuberculin hypersensitivity, and from the intravenous injection of typhoid vaccine and of influenzal virus. This recently identified circulating factor acts directly on the thermoregulatory centers of the brain.

14198* Multiplication of Rat-Leprosy Bacilli in Cultures of Rat Fibroblasts. Elizabeth W. Garbutt, R. J. W. Rees, and Yvonne M. Barr. *Lancet*, v. 2, July 19, 1958, p. 127-128.

14199* (German.) Proteins in the Development of and Protection Against Sicknesses. **Proteine bei der Entstehung und Abwehr von Krankheiten.** H. E. Schultze. *Leder*, v. 9, no. 6, June 1958, p. 145-155.

A survey of causes and preventive methods in some infections. Properties of bacterial toxins as water soluble proteins. Enzyme action. Formation and use of toxoids. Thrombin and transformation of fibrinogen into insoluble fibrin. Polypeptides. Antibodies.

14200 The Medical Management of Cancer. Henry D. Diamond. 179 pp. 1958. Grune & Stratton, New York. (RC261 D54m)

A summary of diagnostic techniques and medical treatments for some of the principal forms of cancer.

14201* Enzymatic Synthesis of Deoxyribonucleic Acid. III. The Incorporation of Pyrimidine and Purine Analogues Into Deoxyribonucleic Acid. Maurice J. Bessman, et al. *National Academy of Sciences, Proceedings*, v. 44, July 1958, p. 633-640.

The deoxyribonucleoside triphosphates of analogues of the pyrimidine and purine bases were prepared chemically and tested as substrates for the enzyme which polymerizes deoxyribonucleotides to deoxyribonucleic acid. The specific replacement of the natural bases by these analogues offers additional support for the base-pairing relationships in the double helix proposed by Watson and Crick for the structure of desoxyribonucleic acid.

14202* The Replication of DNA in *Escherichia coli*. Matthew Meselson and Franklin W. Stahl. *National Academy of Sciences, Proceedings*, v. 44, July 1958, p. 671-682.

By means of density-gradient centrifugation, the authors observed the distribution of N^{15} among molecules of bacterial DNA following the transfer of a uniformly N^{15}-substituted exponentially growing *E. coli* population to N^{14} medium. The nitrogen of a DNA molecule is divided equally between two physically continuous subunits and following duplication, each

daughter molecule receives one of these. The subunits are conserved through many duplications.

14203* Occurrence of Chromosomal Aberrations in Pre-Spermatocytic Cells of Irradiated Male Mice. A. B. Griffen. *National Academy of Sciences, Proceedings,* v. 44, July 1958, p. 691-694.

For the mouse, and presumably for man, there is no period of safety after irradiation; translocations and perhaps other aberrations in dangerous numbers may be transmitted for a long period after the irradiation.

14204* Cytological and Cytochemical Changes in Livers of White Mice Following Intraperitoneal Injections of DNA Preparations From Breast Cancers of Agouti C3H Mice. Cecilie Leuchtenberger, Rudolf Leuchtenberger, and Edwin Uyeki. *National Academy of Sciences, Proceedings,* v. 44, July 1958, p. 700-705.

Livers of white BALB/C and CF_1 mice show cytological and cytochemical alterations after repeated intraperitoneal injections of DNA prepared from breast cancers of agouti C_3H mice. The livers show foci of abnormally large cells containing large nuclei and large polysaccharide-containing nucleoli. There is a decrease of the glycogen in the liver cytoplasm and an increase in the amounts of DNA in the liver nuclei. These alterations were not present in livers of control mice or mice similarly injected with DNA derived from spleen or livers of the same C_3H mice.

14205* Action of Radiation on Mammalian Cells. III. Relationship Between Reproductive Death and Induction of Chromosome Anomalies by X-Irradiation of Euploid Human Cells *in Vitro*. Theodore T. Puck. *National Academy of Sciences, Proceedings,* v. 44, Aug. 1958, p. 772-780.

Data support the interpretation that the primary process leading to destruction of the reproductive ability of cultured single mammalian cells by X-irradiation is a damage to the chromosomes, and they place an upper limit of 40-60 r on the value of the dose needed to produce an average of one chromosome abnormality in an euploid, fibroblast-like human cell under these conditions.

14206 Influence of the Thymus on the Reaction of the Adrenal to Adrenocorticotropic Hormone in the Rat. J. Comsa. *Nature,* v. 182, July 5, 1958, p. 57-58.

In thymectomized and hypophysectomized animals, the decrease of the vitamin C content of the adrenals (corresponding to the same doses of adrenocorticotropic hormone) is significantly greater than in simply hypophysectomized animals. Thus the thymus is antagonistic to the action of adrenocorticotropic hormone.

14207 Sexually Mature Individuals of *Xenopus laevis* From the Transplantation of Single Somatic Nuclei. J. B. Gurdon, T. R. Elsdale, and M. Fischberg. *Nature,* v. 182, July 5, 1958, p. 64-65.

It is possible to transplant nuclei without impairing their ability to bring about normal development. Some nuclei are capable of giving normal development very shortly before the organ of which they are part becomes functional; normal development was obtained from presumptive somite nuclei nine hours before the first muscular responses. Normal development results from nuclei of more advanced stages in *Xenopus* than in *Rana pipiens*. A number of monozygotic frogs have been obtained from single donors.

14208 Biochemical Mutants in Bacteria With Impaired Respiration. G. F. Gause. *Nature,* v. 182, July 12, 1958, p. 97-98.

14209 Lung Cancer and Cigarettes? Ronald A. Fisher. *Nature,* v. 182, July 12, 1958, p. 108.

Cites evidence from twin-studies to show that smoking habits may be, to some extent, genotypically controlled. In 51 monozygotic twin pairs, 33 pairs were wholly alike in their smoking habits. In 31 dizygotic pairs, only 11 were wholly alike.

14210 A Correlation Between the Compositions of Deoxyribonucleic and Ribonucleic Acids. A. N. Belozersky and A. S. Spirin. *Nature,* v. 182, July 12, 1958, p. 111-112.

Results suggest that part at least of the ribonucleic acid of the cell depends on the deoxyribonucleic acid, and that the two nucleic acids may even be similar with respect to their base compositions. On the other hand, the small value of the regression indicates that the greater part of the cell ribonucleic acid is relatively independent of the deoxyribonucleic acid.

14211 A Possible Mechanism for the Initial Transfer of the Genetic Code From Deoxyribonucleic Acid to Ribonucleic Acid. Geoffrey Zubay. *Nature,* v. 182, July 12, 1958, p. 112-113.

Predicts a necessary relation between base composition of the two nucleic acids such that the ratio A+T/G+C of the deoxyribonucleic acid should be equal to the ratio G+C/A+U of the ribonucleic acid. Cites evidence to show that this relation holds true for nuclear RNA.

14212 A Genetic Test for Side-Chains in a Phage Chromosome. Myron Levine and Roy Curtiss, III. *Nature,* v. 182, July 12, 1958, p. 126-127.

The results presented do not support the idea of two genes on the same side-chain. Crosses between alleles as close as 0.067 map unit suggest that linearity is still the rule. The alternative hypothesis of individual loci on individual side-chains, while not ruled out by these experiments, seems improbable. The expectation that the double-recombinant classes would increase with decreasing distance between alleles is not borne out by the results.

14213 A New Approach to the Chemotherapy of Cancer. M. B. Sahasrabudhe. *Nature,* v. 182, July 19, 1958, p. 163-165.

The tumor derives its energy via the hexose-monophosphate pathway. It may be because of the independence of this pathway from normal regulatory feed-back mechanism that the tumor enjoys autonomy with regard to production of energy for its proliferation. Further, since the hexose-monophosphate pathway is not operative to a major extent in other normal tissues, any interference with that pathway might result in preferentially arresting the tumor growth only. The possibilities and usefulness of antimetabolites against glucose-6-phosphate, 6-phosphogluconic acid, and ribulose-5-phosphate are considered.

14214 Sodium Fluoroacetate as a Protecting Agent Against Irradiation. Z. M. Bacq, P. Fischer, A. Herve, C. Liébecq, and S. Liébecq-Hutter. *Nature,* v. 182, July 19, 1958, p. 175-176.

When injected 5 hrs. before irradiation sodium fluoroacetate reduced X-ray induced deaths to 40% after 21 days, compared with 94% mortality in control rats.

14215 Dependence of Bone Marrow Cells on the Liver for Purine Supply. L. G. Lajtha and J. R. Vane. *Nature,* v. 182, July 19, 1958, p. 191-192.

14216* (German.) Effects of Cancerigenic Hydrocarbons on *Chromobacterium violaceum*. **Über die Wirkung cancerogener Kohlenwasserstoffe auf *Chromobacterium violaceum*.** A. Graffii and D. Fritz. *Naturwissenschaften,* v. 45, no. 13, July 1958, p. 320-321.

Investigation of the eventual mutagenic effects of cancerigenic substances in a pigment-forming bacterium in different solutions; discusses mutations involving respiration, anaerobic glycolysis, nitrate reduction, gelatine condensation, and serological specificity.

14217* (Italian.) Activity of the Ethionine Isomers on the Metabolism of the Liver Cell. **Attività degli isomeri dell'etionina sul metabolismo della cellula epatica.** Aldo Cestari, Carlo Rizzoli, and Pietro Dessi. *Ricerca Scientifica,* v. 28, no. 4, Apr. 1958, p. 756-764.

The acute administration of the *L*, *D*, and *DL*-form of the antagonist to the adult rat leads to a strong accumulation of hepatolipids, to a marked and statistically significant reduction of the respiratory activity of the liver tissue, and to alterations of the electrophoretic serum picture, especially affecting the transfer fractions.

14218* (Italian.) Method of Preparation and Mitosis-Inhibiting Activity of the Compound Trichlormethyltriethanolamine-Chlorocarbonate in "*Allium cepa*". **Metodo di preparazione e attività mitoinibitrice in *Allium cepa* del composto: chlorocarbonato di trichlorometile-trietanolammina.** Paolo Malatesta and Giovanna Quaglia. *Ricerca Scientifica,* v. 28, no. 4, Apr. 1958, p. 801-807.

The compound, within the range of the experiments indicated and the dosages used (0.08 M solution), is not lethal to the plant, although it causes a permanent inhibition of the mitoses in root tips.

14219* (Italian.) The Action of Ethionine in Precancerogenesis of Butter Yellow. **Azione dell'etionina nella precancerogenesi da giallo burro.** Aldo Cestari, Carlo Rizzoli, and Pietro Dessi. *Ricerca Scientifica*, v. 28, no. 6, June 1958, p. 1178-1184.

The authors suggest that the simultaneous administration of the cancerogen and ethionine leads to an interaction of the two substances in the liver cells, which effects a partial decrease of the cell damages each singly produces. The possible pathways of this interaction are discussed.

14220 Chromosome Studies of Primates. The Application of New Culture and Cytological Techniques Should Help Solve Some Puzzles of Evolution. Michael A. Bender and Lawrence E. Mettler. *Science*, v. 128, July 25, 1958, p. 186-190.

14221 Common Antigens in Tissue Culture Cell Lines. Lewis L. Coriell, Milton G. Tall, and Helen Gaskill. *Science*, v. 128, July 25, 1958, p. 198-199.

Antigenic analysis of various tissue-culture cell lines by means of the complement-fixation test indicated extensive sharing of common antigens by long-term tissue-culture cell lines even between cells from different species.

14222 Deoxyribonucleic Acid Synthesizing Cells in Peripheral Blood of Normal Human Beings. V. P. Bond, E. P. Cronkite, T. M. Fliedner, and P. Schork. *Science*, v. 128, July 25, 1958, p. 202-203.

Suggests that DNA-synthesizing monocytes in the peripheral blood may be tissue histiocytes in transit to needed sites.

14223 Dynamics of Release of Histamine From Tissue Mast Cell. Douglas E. Smith. *Science*, v. 128, July 25, 1958, p. 207.

Interprets changes in the refractile properties of mast cell granules after treatment with histamine releasers as indicating the release of histamine from binding with heparin.

14224 Life-Shortening by Whole- and Partial-Body X-Irradiation in Mice. Robert F. Kallman and Henry I. Kohn. *Science*, v. 128, Aug. 8, 1958, p. 301-302.

14225 Simple Tissue-Culture Technique for Quantitating Free Migration of Reticulo-Endothelial Cells. A. W. B. Cunningham and J. P. Tupin. *Science*, v. 128, Aug. 8, 1958, p. 306.

This work confirms the ability of cells in the spleen to migrate in a fluid medium.

14226 News of Science. *Science*, v. 128, Aug. 22, 1958, p. 402-406.

Excerpts from the summary and conclusions of the report of the United Nations Scientific Committee on the Effects of Atomic Radiation.

14227 A Universal Molecule of Living Matter. Martin D. Kamen. *Scientific American*, v. 199, no. 2, Aug. 1958, p. 77 + 3 pages.

A popular account of the tetrapyrrole ring which occurs in the chlorophyll of plants, the hemoglobin of blood and in many enzymes which, like hemoglobin, take part in respiration.

14228 The Cerebellum. Ray S. Snider. *Scientific American*, v. 199, no. 2, Aug. 1958, p. 84-90.

Mapping of its electrical circuits indicates it may be a monitor of communication between brain and body.

14229* Transfer of Acquired Tolerance to Skin Homografts in Mice. Carlos Martinez, et al. *Society for Experimental Biology and Medicine, Proceedings*, v. 98, no. 3, July 1958, p. 640-641.

Newborn mice of the ZBC strain intravenously with living spleen cells taken from donors of the same strain in which tolerance to Ce tissues was previously induced, became tolerant to this strain and accepted homologous skin grafts from Ce donors. This would indicate that acquired tolerance can be transferred to an isologous individual at birth by the intravenous injection of spleen cells taken from a tolerant donor.

14230* Cosmic Radiation and Its Possible Biological Effects. T. F. Sandeman. *Spaceflight*, v. 1, no. 8, July 1958, p. 291-296.

A popular account of the principles of nuclear physics and genetics involved in radiation damage to living cells.

14231* Human Tolerance to Some of the Accelerations Anticipated in Space Flight. Stuart Bondurant, et al. *U. S. Armed Forces Medical Journal*, v. 9, Aug. 1958, p. 1093-1105.

Acceleration of the anticipated magnitude and duration is best tolerated with the body positioned so that the forces act transversely in a chest-to-back or back-to-chest direction. Three-stage accelerations sufficient to reach orbital velocity, with peaks of either 8, 10, or 12 g, are tolerable in this position. Such acceleration patterns are also sufficient to reach escape velocity. Some of the patterns of the deceleration of re-entry can be tolerated in the seated, forward-facing position with the aid of an effective restraint system. Tolerance would be only slightly improved by rotating the subject to face aft during re-entry. Immersion of the entire subject in water enables the attainment of tolerance times greater than twice those reached in any other way. The full possibilities of this method of protection have not been explored.

14232 March 1957 Medical Survey of Rongelap and Utirik People Three Years After Exposure to Radioactive Fallout. Robert A. Conard, et al. *U. S. Atomic Energy Commission, BNL*-501, Mar. 1957, 26 pp. (UF767 Un3.1bn Contin.)

14233 Homeostatic Mechanisms. Report of Symposium Held June 12 to 14, 1957. *U. S. Atomic Energy Commission, BNL*-474 (C-25), May 1958, 270 pp. (UF767 Un3.-bn Contin.)

Homeostatic processes which are involved in controlling concentration of the formed elements of the blood; homeostais in blood volume and body water; general principles of homeostasis.

14234 Radioisotope Scanning. Marshall Brucer. *U. S. Atomic Energy Commission, ORINS*-20, Jan. 1958, 169 pp. (UF767 Un3.1ori Contin.)

An introductin to the use of the area scan in medical diagnosis.

14235 The Biochemical and Physiological Functions of the Cell Surface. Aser Rothstein. *U. S. Atomic Energy Commission, UR*-520, Mar. 28, 1958, 29 pp. (UF767 Un3.1ru Contin.)

The enzymes of the yeast cell surface, compartmentalization of the surface layers, ion binding properties, permeability, transfer of sugars into the cell, and active transport of ions such as potassium, hydrogen, phosphate, magnesium, and manganese.

14236* Effect of Total-Body X Radiation From Near-Threshold to Tissue-Lethal Doses on Small-Bowel Epithelium of the Rat. I. Changes in Morphology and Rate of Cell Division in Relation to Time and Dose. R. Bland Williams, Jr., et al. **II. Changes in Nucleic Acid and Protein Synthsis in Rlation to Cell Division.** Jane Nicolet Toal, et al. *U. S. National Cancer Institute, Journal*, v. 21, no. 1, July 1958, p. 17 + 42 pages + 20 plates.

14237* Cytologic and Functional Characterization of Single Cell Clones Isolated From the Krebs-2 and Ehrlich Ascites Tumors. Theodore S. Hauschka and Albert Levan. *U. S. National Cancer Institute, Journal*, v. 21, no. 1, July 1958, p. 77-111 + 12 plates.

Clones have typical chromosome numbers with individual modes in the near-tetraploid range of 72 to 85. Morphologically new chromosomes, recognizable as metacentric, extra long, and minute units, have been incorporated in the stemline karyotypes of some clones. The chromosome-length measurements suggest frequent intrachromosomal rearrangements with consequent genetic innovations due to position effects. Virulence differed among the clones. Antigenic diversity of the Ehrlich clonal branches was apparent from their dissimilar histocompatibility with 129/RrJax mice. Clonal individuality in chromosomal, physiologic, and immunologic traits supports the view that tumor progression is facilitated by continuous selective, rather than adaptive, population shifts within a randomly mutating multiple stemline system.

14238* Lymphatic Tissue Changes in Lethally Irradiated Mice Given Spleen Cells Intravenously. C. C. Congdon, T. Makinodan, N. Gengozian, I. C. Shekarchi, and I. S. Urso. *U. S. National Cancer Institute, Journal*, v. 21, no. 1, July 1958, p. 193-203 + 4 plates.

The treatment of X-radiated mice with isologous spleen caused quicker regeneration of splenic white pulp and of lymph nodes than did treatment with isologous bone marrow.

14239* (Polish.) Chemical Constitution and Biological Activity. **Budowa chemiczna a działanie biologiczne.** J. Grundland. *Wiadomosci Chemiczne*, v. 12, Apr. 1958, p. 207-222.

14240* (Russian.) Investigations of the Effect of Ionizing Radiation on Natural Immunity. **Issledovaniia o vliianii ioniziruiushchikh izlucheniĭ na estestvennyĭ immunitet.** V. L. Troitskiĭ, M. A. Tumanian, and A. Ia. Fridenshteĭn. *Zhurnal Mikrobiologii, Epidemiologii, i Immunobiologii*, v. 29, no. 6, June 1958, p. 3-9.

During and at the end of disease due to radiation the self infection processes are important. They are caused by commensals, or by pathogenic microbes. Bacteremia due to radiation is the result of the suppression of the self purification process of the organism in the intestinal wall.

See also: **14377** (irradiation of ergosterol); **14738** (a structure code for organic compounds); **15272** (effect of plastic on bacteria).

CERAMICS AND CONCRETE

14241 Tumbling Mills and Structural Clay Products. Fred C. Bond. *American Ceramic Society Bulletin*, v. 37, Aug. 1958, p. 361-363.

Theories for evaluating the relative mechanical efficiency of size reduction processes in rod or ball mills.

14242 Reactions Between Iron Oxides and Alumina-Silica Refractories. Arnulf Muan. *American Ceramic Society, Journal*, v. 41, Aug. 1958, p. 275-286.

Phase equilibrium data for the system FeO-Fe_2O_3-Al_2O_3-SiO_2 were used to evaluate the attack of iron oxides on alumina-silica refractories under various idealized conditions which approach those occurring in practice. The extent of attack and the nature of the reactions at various levels of O_2 pressure are discussed.

14243 Studies in the System CaO-Al_2O_3-SiO_2-H_2O. III. New Data on the Polymorphism of Ca_2SiO_4 and Its Stability in the System CaO-SiO_2-H_2O. Della M. Roy. *American Ceramic Society, Journal*, v. 41, Aug. 1958, p. 293-299.

14244 Grain Growth in Nickel Ferrites. Pascal Levesque, Lawrence Gerlach, and J. E. Zneimer. *American Ceramic Society, Journal*, v. 41, Aug. 1958, p. 300-303.

Experimental evidence indicates that the presence of polyphase material is favored by excess NiO and that discontinuous grain growth can be accounted for by excess Fe_2O_3. Quantitative measurements of isothermal grain growth rates in stoichiometric nickel ferrite yielded an energy of activation of 90 kcal. per mole for the process.

14245 Mechanisms Involved in Securing Dense, Vitrified Ceramics From Preshaped Partly Crystalline Bodies. R. F. Vines, J. O. Semmelman, P. W. Lee, and F. P. Fonvielle, Jr. *American Ceramic Society, Journal*, v. 41, Aug. 1958, p. 304-309.

The internal porosity of ceramics shaped before fusion has been improved by three firing techniques: firing *in vacuo*, firing in diffusible gas, and finish firing and cooling under pressure.

14246 Efflorescence Resulting From Sulfates in Clay Raw Materials. Wayne E. Brownell. *American Ceramic Society, Journal*, v. 41, Aug. 1958, p. 310-314.

An attempt was made to isolate the effects of sulfates in clay raw materials on efflorescence from the effects of sulfides and sulfurous fuels. A low-sulfur shale was used and sulfates were added in different amounts and particle sizes. It was found that sulfates react with clays between 1800 and 1900 F with the result that efflorescence is reduced.

14247 Optical and Physical Properties of Some Calcium Aluminate Glasses. H. C. Hafner, N. J. Kreidl, and R. A. Weidel. *American Ceramic Society, Journal*, v. 41, Aug. 1958, p. 315-323.

Calcium aluminate glasses containing alkali oxides and iron oxide will transmit infrared radiation to about 6μ and still have satisfactory working properties. Their refractive index, density, expansion, Young's modulus, modulus of rupture, fracture velocity, Knoop hardness, and some electrical and chemical properties are evaluated.

14248 Viscosity, Density, and Electrical Resistivity of Molten Alkaline-Earth Borate Glasses With 3 Mole % of Potassium Oxide. L. W. Coughanour, Leo Shartsis, and H. F. Shermer. *American Ceramic Society, Journal*, v. 41, Aug. 1958, p. 324-329.

14249* Origin, Evolution, and Effects of the Air Void System in Concrete. I. Entrained Air in Unhardened Concrete. Richard C. Mielenz, et al. **II. Influence of Type and Amount of Air-Entraining Agent.** James E. Backstrom, et al. *American Concrete Institute, Journal*, v. 30, no. 1, July 1958; no. 2, Aug. 1958; *ACI Proceedings*, v. 55, 1958, p. 95-121; p. 261-272.

Shows fundamental importance of the composition and proportion of air-entraining agent employed, water-cement ratio, and the method and intensity of compaction. Air-entraining agents of differing chemical composition produce air voids of different size, distribution, and spacing. The amount of agent also has an effect on these parameters, reducing the air void size and spacing when used in increasing amounts. In general, the factors which tend to reduce spacing also tend to increase freezing-thawing resistance of concrete.

14250* Load Test of 120-ft Precast, Prestressed Bridge Girder. Fazlur R. Khan and Andrew J. Brown. *American Concrete Institute, Journal*, v. 30, no. 1, July 1958; *ACI Proceedings*, v. 55, 1958, p. 139-150.

First the concrete girder alone was loaded to cracking. Then a 9-ft. wide and 7-in. thick slab was cast to form a composite unit which was loaded to failure.

14251* Fatigue of Concrete—A Review of Research. Gene M. Nordby. *American Concrete Institute, Journal*, v. 30, no. 2, Aug. 1958; *ACI Proceedings*, v. 55, 1958, p. 191-219.

More than 100 publications were surveyed, including foreign literature, and the most important investigations are summarized. Compression, flexure, and tension studies in fatigue of bond, reinforced concrete, and prestressed concrete.

14252 Phosphate Bonding of Refractory Compositions. Herbert D. Sheets, Jack J. Bulloff, and Winston H. Duckworth. *Brick & Clay Record*, v. 133, no. 1, July 1958, p. 55-57.

A process was developed for bonding alumina, zirconia, mullite, beryllia, or silicon carbide with phosphoric acid or aluminum phosphate, causing the mixture to set, and making a castable substance whose refractories is essentially that of the aggregate.

14253 An Automatic Moisture Indicator. M. E. C. Stedham. *British Ceramic Society, Transactions*, v. 57, July 1958, p. 381-392.

The loss in weight caused by heating a sample of ground clay is expressed as a fraction of the initial weight. An electrical output proportional to this fraction is given, and can be made to indicate percentage moisture content on a suitable meter or recorder. All operations, including the collection of samples, are carried out mechanically, thereby dispensing with the need for an operator.

14254 New Ideas in Instrumentation for Ceramic Kilns. V. Raymond J. Brown, editor. *Ceramic Age*, v. 72, no. 2, Aug. 1958, p. 16-20.

Design and operation of pyrometers, thermocouples, recorders, and control equipment.

14255* (French.) Stability and Mode of Decomposition of Cubic Solid Solutions of Zirconia. **Sur la stabilité et le mode de décomposition des solutions solides cubiques de la zircone.** Robert Collangues and Jochen Stöcker. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 26, June 30, 1958, p. 3641-3644.

A study showing that the solid cubic solutions ZrO_2-MO and ZrO_2-M_2O_3, are high temperature-stable phases and that their decomposition at ordinary temperatures is a reaction of the eutectoid type.

14256* (Czech.) Use of Cermets as Heating Elements for Electric Resistance Furnaces. **Užití keramických kovů jako topných článků pro elektrickè odporovè pece.** Zdeněk Ryska. *Elektrotechnik*, v. 13, no. 6, June 1958, p. 207-208.

Use of a new material with $MoSi_2 \cdot SiO_2$ base for preparation of resistors. The heating elements are "U" shaped and have high resistance to oxidation, wear, and aging at temperatures to 1600 C.

14257 Glass-Melting Tank Furnaces. Rudolf Günther. (Translated from the German by John Currie.) 232 pp. 1958. Society of Glass Technology, Sheffield. (TP858 G93gtr)

Describes construction and method of operation of modern tanks. Fundamental thermal calculations.

14258 Early High-Strength Concrete for Prestressing. Paul Klieger. *Portland Cement Association, Research Department Bulletin* 91, Mar. 1958, 14 pp. (TP883 P83b Vis.)

Techniques for producing early high-strength concrete are discussed. Data on other properties of high-strength concrete, such as elasticity, creep, drying shrinkage, bond to steel, and durability are presented.

14259* (German.) Inductive Control of a Glass-Melting Furnace. **Die induktive Regelung an einem Glasschmelzofen.** Horst Martin. *Silikatechnik*, v. 9, no. 6, June 1958, p. 250-256.

Equipment consists of a temperature control, an overpressure control, and a control for the gas-air mixture including a correaction of the O_2 content.

14260 Solubility of Water in Molten Alkali Silicates. C. R. Kurkjian and L. E. Russell. *Society of Glass Technology, Journal*, v. 17, June 1958, p. 130T-144T.

Solubility in silicates which are in equilibrium with an atmosphere of steam was investigated as a function of temperature and alkali oxide content.

14261 Some Comments on Indentation Tests on Glass. R. W. Douglas. *Society of Glass Technology, Journal*, v. 17, June 1958, p. 145T-157T.

Tests made by pressing a diamond pyramid lightly into glass give results which can only be interpreted as flow phenomena, but when a spherical indenter is used, circular cracks have always been found.

14262 A Treatise on the Internal Mechanics of Ball, Tube and Rod Mills. H. E. Rose and R. M. E. Sullivan. 258 pp. 1958. Constable & Co., London. (TJ1345 R72t)

Analyzes motion of mill charge, power requirements, grinding processes, wear of grinding media and mill linings, and role of additives in the mill charge.

14263 The Development of Fibrous Glasses Having High Elastic Moduli. J. A. Waugh, V. E. J. Chiochetti, H. I. Glaser, and R. Z. Schreffler. *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 55-290, May 1958, 13 pp. (TL507 Un3.18w Vis.)

Fibers were drawn from cullets containing calcium aluminate and BeO. The BeO fiber was smooth in texture and had a good appearance.

14264 Effect of Calcium Fluoride Additions on the Sintering of Magnesium Oxide. F. Wayne Calderwood and Dave Wilder. *U. S. Atomic Energy Commission, ISC*-910, July 1957, 50 pp. (UF767 Un3.1is Contin.)

Specimens were formed at very low pressures to simulate compaction achieved in the jolt-pack technique, and at higher pressures commonly encountered in powder-pressing of ware. Specimens were fired in an induction furnace and held for predetermined periods at temperatures ranging from 1300 to 1900 C. Shrinkage, bulk density, and grain growth factor were determined and are presented as a function of composition and temperature.

14265 Pressure Induced Metallic Transitions in Insulators. B. J. Alder and R. H. Christian. *U. S. Atomic Energy Commission, UCRL*-5210, Nov. 1957, 7 pp. (UF767 U3u Contin.)

Presents evidence that several ionic and molecular crystals change their conductivity into the range of metallic conductivities when subjected to a pressure of about 250,000 atm.

14266* (Russian.) Silicate Glasses With Electronic Conductivity. **Silikatnye stekla s elektronnoi provodimost'iu.** O. V. Mazurin, G. A. Pavlova, E. Ia. Lev, and E. K. Leko. *Zhurnal Teknicheskoĭ Fiziki*, v. 27, no. 12, Dec. 1957, p. 2702-2703.

Review of assumptions and experiments, with ionic conductivity of silicate and borate glasses.

14267* (Russian.) Effect of Some Physico-Mechanical Properties of Brittle Materials on the Process of Their Polishing. **Vliianie nekotorykh fiziko-mekhanicheskikh svoistv khrupkikh materialov ma protsess ikh shlifovki.** F. K. Aleinikov. *Zhurnal Teknicheskoĭ Fiziki*, v. 27, no. 12, Dec. 1957, p. 2725-2737.

Effect of predominant properties of marble, various glasses, natural crystal, ruby, and other materials on polishing characteristics such as productivity, width of relief, and crumbling layers.

See also: **14443** (silicones on brick); **14765** (electric furnaces); **14852** (hot tops for steel ingots); **14906** (gating system for refractory shaped pieces); **14997** (ceramic tool gages); **15049** (X-ray stress determination in Al_2O_3 insulators).

CHEMICAL ENGINEERING

14268 Advances in Petroleum Chemistry and Refining. Kenneth A. Kobe and John J. McKetta, Jr., editors. v. I. 641 pp. 1958. Interscience Publishers, New York. (TP690.A1 Ad95 Vis.)

Covers economics and future trends, unit operations and design, refining processes, petrochemicals, and mechanical equipment.

14269 American Gas Association, Proceedings (Annual Volume), v. 39, 1957, 306 pp. American Gas Assn., New York. (TP700 Am35p Vis.)

14270 Heat Transfer to Water in Turbulent Flow in Internally Heated Annuli. Ralph P. Stein and William Begell. *A.I.Ch.E. Journal*, v. 4, no. 2, June 1958, p. 127-131.

Nearly 900 values of local heat transfer coefficients were correlated for water flowing through long annuli ⅛, ¼, and ⅜-in. wide, electrically heated at their inner surfaces and containing three spacer ribs.

14271 Momentum and Mass Transfer by Eddy Diffusion in a Wetted-Wall Channel. A. M. Dhanak. *A.I.Ch.E. Journal*, v. 4, no. 2, June 1958, p. 190-196.

Role of eddy diffusion of mass (water vapor) and momentum was investigated in a specially devised wetted-wall channel in which the rippling of the liquid film was eliminated.

14272 The Mechanics of Moving Vertical Fluidized Systems. III. Application to Cocurrent Countergravity Flow. D. L. Struve, L. Lapidus, and J. C. Elgin. *Canadian Journal of Chemical Engineering*, v. 36, no. 4, Aug. 1958, p. 141-152.

Concludes that the experimental results support the validity of the basic assumption for the above flow of liquid-solid systems.

14273 Mixing Studies on a Perforated Distillation Plate. A. I. Johnson and J. Marangozis. *Canadian Journal of Chemical Engineering*, v. 36, no. 4, Aug. 1958, p. 161-168.

Actual splashing measurements were reported and correlated under different conditions of flow rates, weir height, kinematic viscosity of the liquid, and some aspects of tray geometry.

14274 The Relationship Between the Capacity and Efficiency of Dewaxing Filters. R. M. Butler. *Canadian Journal of Chemical Engineering*, v. 36, no. 4, Aug. 1958, p. 182-186.

Changes in the balance between throughput, and the sharpness of separation can be made by varying such quantities as dilution ratio, speed of filter rotation, quantity of wash applied, and wax content of the feed.

14275* (French.) Demineralization and Organic Substances. **Déminéralisation et substances organiques. I.** P. F. J. Bogers. **II.** Absorption of Humic Acids With an Ion Exchanger. **L'absorption des acides humiques par les échan-**

geurs anioniques. G. J. de Jong and J. C. Jansen. *Centre Belge d'Étude et de Documentation des Eaux, Bulletin No.* 40, 1958, p. 112-123.

14276 Costs Favor Hot Carbonate Process. A. G. Eickmeyer. *Chemical Engineering*, v. 65, Aug. 25, 1958, p. 113-116.

Presents recent information about the process of acid gas removal, its comparative economics, and some of its corrosion history.

14277 Chemical Engineering in West Germany. Ralph Landau. *Chemical Engineering Progress*, v. 54, July 1958, p. 64 + 5 pages.

14278 Direct Nitric Route Yields Tetroxide Too. *Chemical Week*, v. 83, Aug. 2, 1958, p. 67-68.

The German Hoko HNO_3 process offers flexibility, simplicity, and compactness.

14279 Equipment for Small-Scale Chlorination Plants. III. Solid-Gas and Gas-Gas Chlorinations. Edward C. Page, Jr. *Cost Engineering*, v. 3, no. 3, July 1958, p. 85-91.

Economics of the production of metal chlorides by the combustion of the solid metal in a chlorine atmosphere.

14280* The Modernization of Imperial Oil Refinery at Halifax. C. M. Stewart. *Engineering Journal*, v. 41, July 1958, p. 70-76.

Indicates some of the reasons behind rebuilding the refinery and some of the design and construction problems encountered in the execution of the project.

14281 Low Cost Seen for Desalting Sea Water. *Engineering News-Record*, v. 161, no. 5, July 31, 1958, p. 44.

Four methods are compared. Predicts costs at 50 cents per 1000 gal.

14282 Hydrazine and Water Treatment. 157 pp. 1958. Whiffen & Sons, Ltd., London. (TJ379 H99)

Thirteen papers and discussions show that hydrazine is an eminently suitable protector. Account of the proceedings of the International Conference held at Bournemouth, May 15-17, 1957.

14283 Chemical Exchange. D. R. Augood. *Industrial Chemist*, v. 34, Aug. 1958, p. 435-441.

Transient behavior of exchange units is discussed and some confusion associated with the use of the separation factor is clarified. Exchange methods which are used to separate the isotopes of Li, K, B, N, C, O, and S are discussed.

14284 Theory of Aerosol Filtration. S. K. Friedlander. *Industrial and Engineering Chemistry*, v. 50, Aug. 1958, p. 1161-1164.

A method based on an analysis of the diffusion equation will help in filter design and correlation of experimental data.

14285* Solid-Liquid Extraction. III. Stagewise Calculations. D. C. Freshwater. *Perfumery and Essential Oil Record*, v. 49, July 1958, p. 398-403.

14286* Separation of Gases in Soviet Refineries. P. A. Smirnov. *Petroleum*, v. 21, Aug. 1958, p. 286-289.

An account of Soviet work of interest to both designers and those working on the plants, in resolving the practical problems which arise in the development of projects and various gas separation plants.

14287* Coming Offshore: More Fresh Water. *Petroleum Week*, v. 7, no. 9, Aug. 29, 1958, p. 20-22.

Improved equipment and new processes to produce fresh water from sea water for offshore oil operations loom as a distinct possibility.

14288* El Paso Builds 'Inside-Outside' Plant. *Petroleum Week*, v. 7, no. 9, Aug. 29, 1958, p. 32 + 1 page.

A new natural gasoline plant now under conestruction will be virtually self-enclosed against adverse weather.

14289 Plant Design and Economics for Chemical Engineers. Max S. Peters. 511 pp. 1958. McGraw-Hill, New York. (TP155.5 P44p)

Plant design and applied economics are treated as one combined subject to answer the vital question, "will we realize a profit from this venture?"

14290* Saline Water Conversion by Freezing. H. M. Hendrickson. *Refrigerating Engineering*, v. 66, Aug. 1958, p. 31 + 7 pages.

A program to investigate existing commercial freezing equipment, to develop a practical freezing-melting cycle, and to predict costs is described.

14291 The Science of High Explosives. Melvin A. Cook. 440 pp. 1958. Reinhold Publishing Corp., New York. (TP270 C77s)

Describes detonation processes and related phenomena with theoretical interpretations and copious illustrations, presents fundamental principles and pertinent facts for technological applications, including commercial blasting, demolition, shaped charges, fast particles, shock and blast wave propagation, impact loading, strength, penetration, and conditions for explosion of materials.

14292* Split Flow Treatment. Lloyd V. Owens. *Water & Sewage Works*, v. 105, Aug. 1958, p. 311-316.

Process consists of treating water from wells containing Fe and Mn in upflow coagulation basins and mixing the effluent with untreated water from other wells.

14293* Water Purification, Distribution, and Resources. *Water & Sewage Works*, v. 105, Aug. 1958, p. 319-330.

Previous issues carried reports on papers presented at the 78th Annual AWWA Conference. Concludes the report of that meeting with reviews and abstracts of other papers presented at the meeting.

14294* Refinery Expansion in the Western World. Alan L. Paget. *World Petroleum*, v. 29, July 1958, p. 74-79.

Western Germany, Netherlands, and United Kingdom are engaged in extensive programs.

14295* Refining Grows in Austria and Eastern Europe. Rudolf Sobotka. *World Petroleum*, v. 29, July 1958, p. 114-116.

See also: **14351** (unsymmetrical dimethylhydrazine); **14376** (synthesis of hydrocarbons in the gasoline range); **14463** (application of Ti esters); **15168** (optimum operation of catalytic cracking unit); **15333** (welding of Ni-alloy chemical equipment); **15342** (welded chemical equipment); **15343** (welding in chemical construction); **15344** (welded chemical equipment).

CHEMISTRY—ANALYTICAL

14296* (Romanian.) A New Method for the Separation and Quantitative Determination of Cadmium and Copper. **O nouă metodă pentru separarea bismutului de cadmiu şi cupru şi dozarea lor.** Fr. Mihai. *Academia Republicii Populare Romîne. Baza de Cercetari Ştiinţifice Timişoara. Studii şi Cercetări Ştiinţifice. Seria Ştiinţe Chimice*, v. 4, nos. 3-4, July-Dec. 1957, p. 123-128.

Bismuth was separated and quantitatively determined in the form of bismuth gallate; Cd and Cu were determined in the form of diliturates. Reduction of the volume of the filtrate takes 30 min.; quantitative determination of the elements of the mixture takes one hr.

14297* Determination of Ozone in Air by Neutral and Alkaline Iodide Procedures. D. H. Byers and B. E. Saltzman. *American Industrial Hygiene Association Journal*, v. 19, no. 3, June 1958, p. 251-257.

14298* A Modified Method for the Determination of Polycyclic Hydrocarbons. B. T. Commins. *Analyst*, v. 83, July 1958, p. 386-389.

Modification involves the separation of the hydrocarbons on alumina columns with cyclohexane, and then the spectrophotometric determination of the hydrocarbon content of each fraction separately over a narrow waveband. Results of repeated determinations on aliquots of extracted smoke samples are given.

14299* The Colorimetric Determination of Phosphorus. D. N. Fogg and N. T. Wilkinson. *Analyst*, v. 83, July 1958, p. 406-414.

In the colorimetric determination of phosphate by Denigès's method the molybdophosphate is reduced by the addition of $SnCl_2$. In the method described, $SnCl_2$ has been replaced by ascorbic acid. Color development is rapid at the boiling-point of the solution, and, once developed, the Mo blue color is extremely stable at room temperature.

14300* The Polarographic Determination of Amino Acids Containing Thiol and Disulphide Groups. D. B. Coult. *Analyst*, v. 83, July 1958, p. 422-425.

Compounds can be determined in denatured and deproteinized sera and in serum hydrolysates. The method was used to follow the reaction between mustard gas and the amino acids. Penicillin can be determined after conversion to penicillamine. Possible applications of the method to investigate the serological diagnosis of cancer and the therapeutic action of amino acids against chemical agents are suggested.

14301 (German.) Test Sampling and Determination of Hydrogen in Steel Under Service Conditions. **Probenahme und Bestimmung von Wasserstoff im Stahl unter Betriebsbedingungen.** Herbert Zitter and Helmut Krainer. *Archiv für das Eisenhüttenwesen*, v. 29, no. 7, July 1958, p. 401-408.

Description of the apparatus. Degasification in connection with temperature and time. Cooling and storage of the specimens. Effect of pouring height and air humidity during sampling.

14302* (Czech.) Titrations With Quinol and Analogous Reducing Agents. **Titrace hydrochinonem a podobnými redukujícími činidly. IX.** Stability of Standard Quinol Solutions. **O stálosti odměrných roztoků hydrochinonu. X.** Titration of Cerium, Chromium, and Vanadium and the Possibility of Their Simultaneous Determination. **Titrace ceru, chromu a vanadu a možnost jejich současného stanovení.** Ladislav Mráz, Vladimír Simon, and Jaroslov Zýka. *Chemické Listy*, v. 52, no. 6, June 1958, p. 1083-1092.

Investigation of stability of standard quinol solutions of various concentrations in acid and alkali media; study of changes occuring in these solutions and of reaction conditions for an accurate determination of small amounts of Ce, V, and Cr; possibility of determining these elements in presence of each other by a single titration with standard quinol solutions.

14303* (German.) Paper Chromatography of Some Acid Wool Dyes. **Zur Papierchromatographie einiger saurer Wollfarbstoffe. II.** J. Kolšek. *Chemiker-Zeitung*, v. 82, no. 13, July 10, 1958, p. 457-461.

Separation according to an earlier method using the same solvent: 3/v/p methanol, 15 v/p amylalcohol, 46 v/p benzene, and 8 v/p water.

14304 Correlation of Infrared Spectra With the Structure of Substituted Ferrocenes. M. Rosenblum. *Chemistry & Industry*, 1958, no. 30, July 26, p. 953.

14305* (French.) Simultaneous Quantitative Analyses of Formaldehyde and Polyoxymethylene. **L'analyse quantitative simultanée de l'aldéhyde formique et de polyoxyméthylène.** Z. Bellen. *Chimie Analytique*, v. 40, no. 7, July 1958, p. 250-252.

Condensation of aldehyde with dimedon followed by titration of its compounds and determination of the poly-compound by iodometry in alkali medium.

14306* (French.) Ultra-Micro Elementary Organic Quantitative Analysis by Means of Combustion in a Sealed Tube. **Méthodes de combustion en tube scellé pour l'analyse ultramicro élémentaire organique quantitative.** W. Kirsten. *Chimie Analytique*, v. 40, no. 7, July 1958, p. 253-263.

Method of determination of C, H, and N from a single sample of 0.1 mg. weight.

14307 A Rapid Method for the Determination of the Aromatic Contents of Petroleum Fractions Boiling Above the Kerosine Range. B. M. Brook and B. T. Whitham. *Institute of Petroleum, Journal*, v. 44, July 1958, p. 212-215.

An elution chromatographic procedure was developed for the separation and determination of saturates and aromatics in olefin-free fuels and oils by selective adsorption on silica gel. A simple filter paper spotting technique was used to follow the separations.

14308 Gas-Liquid Chromatography. II. Analysis of the Alkali Extract of a Low-Temperature Coal Tar. L. Irvine and T. J. Mitchell. *Journal of Applied Chemistry*, v. 8, pt. 7, July 1958, p. 425-432.

An analysis of the distillate of b.p. 230-250 C separated from the tar acid extract prepared from low-temperature coal tar. Six fractions were separated and a total of 28 phenolic compounds identified by retention-time data and infrared spectroscopy.

14309 A Proposed Non-Ashing Technique Employing Ion-Exchange Resins for the Determination of Lead in Wine. R. A. Edge and N. Penny. *Journal of the Science of Food and Agriculture*, v. 9, July 1958, p. 401-403.

The method proposed is to pass the wine (free from solid particles) down a Dowex-50 column and elute with 4N-HCl. The Pb is determined in the eluate with dithizone.

14310 Determination of Gases in Molybdenum. M. W. Mallett and W. R. Hansen. Paper from "The Metal Molybdenum, Symposium Proceedings", p. 365-393, 1958. American Society for Metals, Cleveland. (TN799.M7 M56)

Apparatus was developed which, at gas volumes less than 0.5 ml, is sensitive to a change of 0.005 ml and in the range 0.5 to 2.5 ml to a change of 0.01 ml. At the 60 ppm oxygen level a minimum agreement of only 10 relative percent is indicated; less at the 10 ppm level. The micro-Kjeldahl and the diffusion-extraction technique are successful for determining N.

14311 Determination of Carbon in Titanium, Zirconium, and Their Alloys by Gravimetric and Conductimetric Methods. D. F. Wood and M. Williams. *Metallurgia*, v. 58, July 1958, p. 47-52.

Carbon in Ti and Zr can be satisfactorily determined by a combustion method involving the use of Ar to moderate the otherwise vigorous oxidation reaction, provided that suitable fluxes are mixed with the sample. The final stages in the analysis can be carried out either gravimetrically or conductimetrically.

14312 Investigations on Colorimetric Methods of Metallurgical Analysis. VI. Estimation of Silicon in Cast Iron Using the Duboscq Type of Colorimeter. G. V. L. N. Murty. *Metallurgia*, v. 58, July 1958, p. 52-54.

A simple procedure for the estimation of Si in pig iron, which compares favorably with the standard gravimetric methods in regard to accuracy attainable and reduces the time of analysis to 15 min.

14313 Methods for Emission Spectrochemical Analysis. 488 pp. 1957. American Society for Testing Materials, Philadelphia. (QD95 Am35m)

The book is divided into four major sections: general practices, nomenclature, spectrochemical analysis of metals, and spectrochemical analysis of nonmetals. The scope, limitations, precision, and accuracy of the methods have been recorded to the extent of data available.

14314* The Spectrophotometric Determination of Molybdenum, Tungsten, and Vanadium in Soils and Plants. I. In Soils. J. H. Watkinson. *New Zealand Journal of Science*, v. 1, no. 2, June 1958, p. 201-219.

14315* (Czech.) Determination of Nitrides of Aluminum, Silicon, Vanadium, and Chromium in Carbon Steels and Low Alloy Steels. **Oznaczanie azotków glinu, krzemu, wanadu i chromu w stalach węglowych i niskostopowych.** E. Wrzesińska. *Prace Instytutów Hutniczych*, 1958, no. 3, p. 180-184.

14316 Proceedings of the Congress on Modern Analytical Chemistry in Industry. 244 pp. 1957. W. Heffer & Sons, Ltd., Cambridge, England. (QD71 C76p)

Twenty-three papers on modern analysis, industrial analytical applications, and developments to meet new industrial problems.

14317 Symposium on Composition of Petroleum Oils, Determination and Evaluation. 288 pp. 1958. American Society for Testing Materials, Philadelphia. (TN870.5 Am35s)

Papers are presented on separation, spectroscopic methods, and general methods and correlations.

14318 Symposium on Ion Exchange and Chromatography in Analytical Chemistry. 57 pp. 1958. American Society for Testing Materials, Philadelphia. (QD133 Am35si)

The three papers and discussions of this symposium were presented at the Fifty-ninth Annual Meeting of the American Society for Testing Materials, June 1956.

14319* (English.) **Analysis of Microquantities of Antimony, Tin and Arsenic in Ferrotungsten.** Hidehiro Goto, Yachiyo Kakita, and Masahiko Sase. *Tôhoku University, Science Reports of the Research Institutes, Ser. A. Physics, Chemistry, Metallurgy*, v. 10, no. 3, June 1958, p. 207-211.

14320* (English.) **Spectrophotometric Determination of Germanium With Quercetin-Sulfonic Acid.** Takuji Kanno. *Tôhoku University, Science Reports of the Research Institutes, Ser. A. Physics, Chemistry, Metallurgy*, v. 10, no. 3, June 1958, p. 251-258.

3,5,7,3',4'-Pentahydroxyflavon-6'-sulfonic acid was readily soluble in water and formed greenish yellow and yellow complexes with Ge, in neutral and strongly acidic solutions respectively, which were also soluble in water. The complex formed in neutral solution was used for the determination of Ge in aqueous solution.

14321 The Determination of Dissolved Argon in Water. E. L. Shirley, C. F. Pachucki, and L. K. Lolos. *U. S. Atomic Energy Commission, KAPL-1890*, Nov. 14, 1957, 18 pp. (UF767 Un3.1ka Contin.)

Dissolved Ar in the primary coolant water of a nuclear reactor presents a problem of accessibility to the reactor at shutdown. Two methods for the analysis of dissolved Ar at low concentrations are described. Both depend upon a mechanical separation of the dissolved gas from the water and analysis of the separated gas by a mass spectrometer.

14322 Non-Destructive Determination of U^{235} Content of Rod-Shaped Fuel Elements by Gamma Pulse Spectrometry. W. C. Judd and M. B. Leboeuf. *U. S. Atomic Energy Commission, KAPL-1925*, July 17, 1958, 30 pp. (UF767 Un3.1ka Contin.)

Method depends on detection of a relatively penetrating 184 k.e.v. γ-ray which is emitted in U^{235} decay.

14323 Determination of Thorium in Uranium Ores and Feeds by Solvent Extraction Employing Thenoyltrifluoroacetone. Paul G. Laux and Ernest A. Brown. *U. S. Atomic Energy Commission, NLCO-742*, May 23, 1958, 27 pp. (UF767 Un3.1nL Contin.)

The TTA extraction method was investigated for the determination of microgram concentrations of Th in U ores and concentrates. The tolerance limits for 18 elements commonly found in U ore concentrates have been established.

14324 Thermometric (Enthalpymetric) Titration of Free Acid in the Presence of Certain Hydrolyzable Ions. Francis J. Miller and Paul F. Thomason. *U. S. Atomic Energy Commission, ORNL-2489*, July 9, 1958, 31 pp. (UF767 U3o Contin.)

The systems studied were Zr in HF, uranyl ion in H_2SO_4, Th in HNO_3, and uranyl ion in HNO_3.

14325* Identification of Some Polynuclear Aromatic Hydrocarbons in Cigarette-Smoke Condensate. Benjamin L. Van Duuren. *U. S. National Cancer Institute, Journal*, v. 21, no. 1, July 1958, p. 1-16.

14326* (Russian.) Analytical Application of 8-Mercaptoquinoline (Thiooxine) and Its Derivatives. **Analiticheskoe primenenie 8-merkaptokhinolina (tiooksina) i ego proizvodnykh.** V. I. Kuznetsov, Iu. A. Bankovsky, and A. F. Iyevinsh. *Zhurnal Analiticheskoĭ Khimii*, v. 13, no. 3, May-June 1958, p. 267-273.

Analytical reactions of 8-mercaptoquinoline are described which are useful for the extractive separation of elements and for the extractive photometric determination of very small amounts of a number of elements.

14327* (Russian.) Use of Thiosemicarbazides in Analysis. **Primenenie tiosemikarbazidov v analize. I.** Quantitative Determination of Monovalent and Bivalent Mercury by Means of 1-Phenylthiosemicarbazide. **Kolichestvennoe opedelenie odnovalentnoi i dvukhvalentnoi rtuti pri pomoschi l-fenil-tiosemikarbazida.** N. V. Koshkin. *Zhurnal Analiticheskoĭ Khimii*, v. 13, no. 3, May-June 1958, p. 308-311.

Method involves titration with 1-phenylthiosemicarbazide in the presence of bivalent Cu salts as indicator.

14328* (Russian.) Dialkyl- and Diaryldithiophosphoric Acids as Analytical Reagents. **Dialkil- i diariltiofosfornye kisloty kak analiticheskie reaktivy. IV.** Separation of Cadmium From Zinc and Other Elements. Gravimetric and Titrimetric Determination of Cadmium. **Otdelenie kadmiia ot tsinka i drugikh elementov. Vesovoe i titrimetricheskoe opredelenie kadmiia.** O. I. Busev and M. I. Ivanyutin. *Zhurnal Analiticheskoĭ Khimii*, v. 13, no. 3, May-June 1958, p. 312-318.

A fairly rapid gravimetric method is based on the formation of cadmium diethyldithiophosphate $[(C_2H_5O_2)PSS]_2Cd$, which is suitable for separating and weighing.

14329* (Russian.) New Fluorimetric Method for the Determination of Gallium. **Novyi metod fluorimetricheskogo opredeleniia galiia.** V. A. Nazarenko and S. Ia. Vinkovetskaia. *Zhurnal Analiticheskoĭ Khimii*, v. 13, no. 3, May-June 1958, p. 327-331.

A method developed for the determination of Ga in ores, coals, metals, and non-ferrous metal industry waste materials.

14330* (Russian.) Determination of Zirconium by Means of Ammonium Benzene- and Naphthalene Seleninate. **Opredelenie tsirkoniia pri pomoshchi benzol- i naftalinseleninata ammoniia.** I. P. Alimarin and V. S. Sotnikov. *Zhurnal Analiticheskoĭ Khimii*, v. 13, no. 3, May-June 1958, p. 332-336.

Ammonium zenzene seleninate and ammonium naphthalene seleninate are suggested for the separation from and determination of Zr in Al, Be, Ti, Nb, Ta, Fe, and rare earths.

14331* (Russian.) The Quantitative Analysis of Cyclohexanone and Cyclohexanol in the Oxidation Products of Cyclohexane by Means of the Infrared Absorption Spectra. **Metod kolichestvennogo analiza tsiklogeksanona i tsiklogeksanola v produktakh okisleniia tsiklogeksana po spektram pogloshcheniia v infrakrasnoĭ oblasti.** I. V. Berezin, N. F. Kazanskaia, and G. B. Meluzova. *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 6, June 1958, p. 1218-1225.

Using specially devised cuvettes and the apparatus IKS-11, equipped with an automatically controlled variable slit and the means for operating in conjunction with the recorder EPP-09, the proposed method requires a minimum of time (10 min.) and small volumes of the specimens (0.5 ml), and at the same time possesses good accuracy (3%). A number of components may be determined with a single cuvette, from bands of differing intensity.

See also: **15216** (Colloquim Spectroscopicum Internationale, Proceedings).

CHEMISTRY—INORGANIC AND GENERAL

14332* (Russian.) Investigation of the Properties of Calcium Hydrosilicates. **Issledovanie svoĭstv gidrosilikatov kal'tsiia.** T. M. Berkovich, D. M. Kheĭker, O. I. Gracheva, L. S. Zevin, and N. I. Kupreeva. *Akademiia Nauk SSSR, Doklady*, v. 120, no. 4, June 1, 1958, p. 853-856 + 1 plate.

Synthesis of hydrosilicates in diluted aqueous suspensions by a hydrothermal method. Calcium hydrosilicates were subjected to X-ray analysis. Curves of differential thermal analysis, loss of weight during heating and IR spectra were determined.

14333* (French.) The Basic Chlorides and Bromides of Magnesium. **Les chlorures et bromures basiques de magnésium.** Yolande Bianco. *Annales de Chimie*, v. 3, May-June 1958, p. 370-404 + 4 plates.

The action of magnesia on chlorides and bromides of Mg was studied as a function of time, temperature, and concentration of the reagents. The solid phases, once freed from their mother liquors, washed with absolute alcohol, and dried, were examined with X-rays and by chemical analysis.

14334 Sodium Derivatives of Stannane. H. J. Emeléus and S. F. A. Kettle. *Chemical Society, Journal*, 1958, July, p. 2444-2448.

Conductometric titration of a solution of Na in liquid NH_3 with stannane shows the formation of stannylsodium (sodiostannane), SnH_3Na, and stannylenedisodium (disodiostannane), SnH_2Na_2.

14335 The Oxides of Uranium. IX. The Decomposition of Carbon Monoxide on Uranium and Thorium Dioxides. L. E. J. Roberts, A. J. Walter, and V. J. Wheeler. *Chemical Society, Journal,* 1958, July, p. 2472-2481.

The decomposition yielding C and CO_2 takes place much faster on urania than on thoria at 500-900 C. Addition of CO_2 to the CO is sufficient to inhibit the decomposition.

14336* Active Nitrogen. K. R. Jennings and J. W. Linnett. *Chemical Society, Quarterly Reviews,* v. 12, no. 2, 1958, p. 116-132.

When N is subjected to an electrical discharge at low pressures, a brilliant peach-colored glow is emitted. When the discharge is switched off a golden-yellow afterglow remains. This glowing gas is called "active nitrogen". This review presents results of recent experiments, and shows how these have led to a more detailed exposition of the atomic theory of active N.

14337* (Czech.) Properties of Orthoperiodic Acid. **Vlastnosti kyseliny orthojodisté. I.** The System HIO_4-H_2O. **Soustava HJO_4-H_2O.** Zdeněk Hauptman. *Chemické Listy,* v. 52, no. 6, June 1958, p. 1015-1027.

Dehydration of orthoperiodic acid showed that in the first stage of dehydration there is a product of the composition $H_7I_3O_{14}$.

14338 Higher Oxides of Silver. William S. Graff and Hans H. Stadelmaier. *Electrochemical Society, Journal,* v. 105, Aug. 1958, p. 446-449.

Samples of higher oxides of Ag were prepared by several chemical and electrochemical procedures. Two distinct higher oxides were produced.

14339 Preparation and Identification of the Thorium Germanides. A. G. Tharp, Alan W. Searcy, and Hans Nowotny. *Electrochemical Society, Journal,* v. 105, Aug. 1958, p. 473-476.

X-ray diffraction studies indicate the existence of at least six thorium germanide phases.

14340 Structure and Stability of Inorganic Azides. B. L. Evans. *Royal Society, Proceedings,* v. 246, ser. A, July 29, 1958, p. 199-203.

14341 Preparation and Properties of Crystals of Potassium and Sodium Azide. R. W. Deryfus and P. W. Levy. *Royal Society, Proceedings,* v. 246, ser. A, July 29, 1958, p. 233-240 + 4 plates.

Gives the methods used to grow NaN_3 and KN_3; describes in detail the brightly colored birefringent bands sometimes found in these crystals when they are viewed between crossed polarizers; demonstrates the role of these regions in radiation-induced decomposition.

14342 Evaluation of Ion Exchange Membranes for Use in the Flurex Process. Erwin W. Neuvar and Wallace W. Schulz. *U. S. Atomic Energy Commission, HW-56096,* May 26, 1958, 48 pp. (UF767 Un3.1hw Contin.)

The over-all efficiency of the Flurex Process, an electrodialytic process for the preparation of uranium(IV) fluoride salts from aqueous uranyl nitrate, depends on the performance of the ion exchange membranes used. Accordingly, the permselectivity, conductivity, and stability of several commercially available ion exchange membranes have been investigated.

14343* (Russian.) New Borides of the Rare Earth Metals. **Novye boridy redkozemel'nykh metallov.** V. S. Neshpor and G. V. Samsonov. *Zhurnal Fizicheskoĭ Khimiĭ,* v. 32, no .6, June 1958, p. 1328-1332.

The existence of the previously unknown hexaborides DyB_6, HoB_6, and LuB_6 and tetraborides DyB_4, HoB_4, and ErB_4 was established and that of the hexaborides of Gd and Er and of the tetraboride of Gd verified. The bond lengths of Me—Me, Me—B, and B—B were calculated. An examination of the ratio of the sum of atomic radii to these values depending upon the atomic numbers of the metals showed that in CaB_6, BaB_6, SrB_6, YbB_6, and ErB_6 the metal is in a bivalent state, whereas in the hexabromides of the other rare earth metals the latter are trivalent.

See also: **14751** (hydrofluoric acid bibliography).

CHEMISTRY—ORGANIC

14344* (Romanian.) The Separation Component in the Synthesis of Organic Dyes. **Componenta de separare în sinteza colorantilor. VII.** Absorption Spectra of Some Azoic Dyes, With the Participation of the Central Naphthalene-1,5 and -1,4-Disazoic Components. **Spectre de absorbtie ale unor coloranti azoici, cu participarea componentelor centrale naftalin-1,5- şi 1,4-disazoice.** I. Reichel and A. Balint. *Academia Republicii Populare Romine. Baza de Cercetari Ştiinţifice Timişoara. Studii şi Cercetări Ştiinţifice. Seria Ştiinţe Chimice,* v. 4, nos. 3-4, July-Dec. 1957, p. 51-63.

The dyeing and spectroscopic treatments described revealed that, because of the disagreeing positions of the substituents in the naphthalene system, the junction of the polyenic chain is markedly relaxed in the 1,5 and 1,4 positions of the naphthalene 1,5- and 1,4-disazoic positions.

14345* (Russian.) Isomeric Transformation of γ-Oxides (Tetrahydrofuranes) to Aliphatic Carbonyl Compounds. **Izomerizatsiia γ-okiseĭ (tetragidrofuranov) v alifaticheskie karbonil'nye soedineniia.** N. I. Shuĭkin and I. F. Bel'skiĭ. *Akademiia Nauk SSSR, Doklady,* v. 120, no. 3, 1958, p. 548-551.

The γ-oxide (tetrahydrofurane) ring can be isomerized in the vapor phase on platinized carbon, splitting the C-O bonds and resulting in the formation of aliphatic carbonyl compounds.

14346 The Reactions of Hydrogen Bromide With Oleic Acid and Its Esters. II. Free Radical Addition. Eric Jungermann and P. E. Spoerri. *American Oil Chemists' Society, Journal,* v. 35, Aug. 1958, p. 393-396.

Variations of the solvents, catalysts, temperatures, dilution, and the ester groups were investigated. Under all conditions a statistical 50:50 distribution of poistion isomers was found.

14347 Preparation of Esters and Anhydrides From Long Chain Fatty Acid Chlorides. C. G. Youngs. *American Oil Chemists' Society, Journal,* v. 35, Aug. 1958, p. 416-417.

Reactants are mixed directly and HCl is stripped from the reaction mixture by operating at reduced pressure.

14348* (French.) Chloromethylation of 3,3'-Dimethoxybiphenyl and of 3,4,3',4'-biphenyl. Synthesis of Derivatives of 2,3,6,7 - Tetramethoxyphenanthrene, 2,3,9,10 - Tetramethoxydibenzo-(a,*c*)-Cycloheptadiene and of Tetramethoxyfluorene. **Chlorométhylation du diméthoxy-3-3' biphényle et du tétraméthoxy-3-4-3'-4' biphényle synthèse de dérivés du tétraméthoxy-2-3-6-7 phénanthrène, du tétraméthoxy-2-3-9-10 dibenzo (a,c) cycloheptadiène et du tétraméthoxy-2-3-6-7-fluorène.** Elisabeth Matarasso-Tchiroukhine. *Annales de Chimie,* v. 3, May-June 1958, p. 405-459.

14349* The Properties and Structures of the 1,8-Terpins and Some Related Compounds. C. S. Barnes. *Australian Journal of Chemistry,* v. 2, no. 2, May 1958, p. 134-146.

The mechanism of formation, and the chemical and hydrate forming properties of the 1,8-terpins are discussed.

14350* Arylation of Aromatic Compounds. VI. Benzoyl Peroxide With Pyridine and Quinoline. K. H. Pausacker. *Australian Journal of Chemistry,* v. 2, no. 2, May 1958, p. 200-210.

Among the products formed when pyridine reacts with benzoyl peroxide are phenylpyridines, benzoic acid, pyridine oxide, and dipyridyls. The phenylquinoline fraction was investigated in detail and the isomer ratio of the mixture evaluated.

14351 Preparation and Properties of Unsymmetrical Dimethylhydrazine. W. G. Strunk. *Chemical Engineering Progress,* v. 54, July 1958, p. 45-48.

Unsymmetrical dimethylhydrazine is unique among hydrazines in possessing complete miscibility with water. Due to the combination of reducing solvent properties it holds promise for applications in antioxidants, paint antiskinning, and fuel additives.

14352 The Formation of Aromatic Hydrocarbons at High Temperatures. I. Introduction. II. An Examination of

"Schroeter Tar". III. The Pyrolysis of 1-4'Phenylbutylnaphthalene. IV. The Pyrolysis of Styrene. G. M. Badger, et al. *Chemical Society, Journal,* 1958, July, p. 2449-2463.

14353 The Synthesis of 2-Phenyl*iso*phosphindoline. Frederick G. Mann, Ian T. Millar, and H. R. Watson. *Chemical Society, Journal,* 1958, July, p. 2516-2519.

14354 Gibberellic Acid. VII. The Structure of Gibberic Acid. B. E. Cross, John Frederick Grove, J. MacMillan, and T. P. C. Mulholland. **VIII. Snythesis of Methyl (±)-α- and -β-3 : 5-Dimethoxycarbonyl-6-(2-methoxycarbonyl-6-Methylphenyl)-3-methylhexanoate.** A. Morrison and T. P. C. Mulholland. *Chemical Society, Journal,* 1958, July, p. 2520-2539.

14355 The Direct Introduction of the Diazonium Group Into Aromatic Nuclei. IV. The Preparation of Diazonium Salts From Phenols. J. M. Tedder and G. Theaker. *Chemical Society, Journal,* 1958, July, p. 2573-2579.

A wide variety of phenolic compounds have been found to react with buffered nitrous acid, to yield diazonium salts. The reaction, which proceeds via the nitrosophenol, shows all the usual characteristics of electrophilic substitution.

14356 Studies in Polycyclic Systems. I. A New Synthesis of Picene. D. Nasipuri. *Chemical Society, Journal,* 1958, July, p. 2618-2622.

Picene is prepared by a method starting with condensation of ethyl 4:6-dioxoheptane-1:5-dicarboxylate with 2-1'-naphthylethyl bromide, the further rings being built on by Dieckmann condensation and reaction with the methiodide of 4-piperidinobutan-2-one.

14357* (Czech.) On Terpenes. **O terpenech. LXXXVIII.** The Structure of Germacrone, the Crystalline Constituent of Bulgarian "Zdravets" Oil. **Struktura germakronu, krystalické součásti bulharské zdravcové silice.** Ilja Ognjanov, et al. **LXXXIX.** A Direct Proof of the Carbon Skeleton of Germacrone. **Přímý důkaz uhlíkatého skeletu germakronu.** Vlastimil Herout and Miloš Suchý. **XC.** Synthesis of 1,7-Dimethyl-4-*iso*propylcyclodecane (Germacrane). **Synthesa 1,7-dimethyl-4-*iso*propylcyklodekanu (germakranu).** Miloš Suchý and František Šorm. *Chemické Listy,* v. 52, no. 6, June 1958, p. 1163-1185.

14358 Esterification of Methylolated Rosin. Jacob C. Minor and Ray V. Lawrence. *Industrial and Engineering Chemistry,* v. 50, Aug. 1958, p. 1127-1130.

This method for preparing improved rosin-based varnishes has several advantages—economy, faster drying, and better water resistance.

14359 The Binary Systems Benzene-Ethyl Methyl Ketone and Benzene-*Cyclo*hexane. M. B. Donald and K. Ridgway. *Journal of Applied Chemistry,* v. 8, pt. 7, July 1958, p. 403-407.

Physical properties and also vapor- and soild-liquid equilibria were determined as functions of the composition.

14360 The Ternary System Benzene-*Cyclo*hexane-Ethyl Methyl Ketone. M. B. Donald and K. Ridgway. *Journal of Applied Chemistry,* v. 8, pt. 7, July 1958, p. 408-415.

Various physical properties and solid- and vapor-liquid equilibria have been determined as functions of the composition.

14361 The Autoxidation of Methyl Elaeostearate. R. N. Faulkner. *Journal of Applied Chemistry,* v. 8, pt. 7, July 1958, p. 448-458.

The autoxidation of the methyl ester of α-elaeostearic acid (the main constituent acid of tung oil) at 37 C under ultraviolet light was examined. The product obtained after absorption of 0.6 mole of O per mole of ester was fractionated by molecular distillation, low-temperature crystallization, and solvent extraction. The fractions were characterized by chemical and physical analysis.

14362 Transformations in the D-Homosteroid Series. The Isomeric 17a, 17a-Glycols. N. L. Wendler and D. Taub. Journal of Organic Chemistry, v. 23, July 1958, p. 953-958.

The formation and various transformations of the isomeric 17a, 17a-dihydroxy- 3a-acetoxy-17β-methyl-D-homoetiocholan-11-ones are described.

14363 Organic Deuterium Compounds. XX. Synthesis of the Deuterated Propadienes. A. T. Morse and L. C. Leitch. *Journal of Organic Chemistry,* v. 23, July 1958, p. 990-994.

Propadiene-d_1, 1,1-d_2, -1,3-d_2, -d_3, -d_4, and butadiene-d_6 were synthesized by dehalogenation of the appropriate halides. A few new halides and their deuterated analogs are reported. A tentative mechanism for their dehalogenation is proposed.

14364 Acid-Catalyzed Condensation of Phenols and Keto Acids. Arthur J. Yu and Allan R. Day. *Journal of Organic Chemistry,* v. 23, July 1958, p. 1004-1006.

Phenol, *o*-cresol, and 2,6-xylenol were condensed with various keto acids or their methyl esters, in the presence of acid catalysts, to form *gem*-bis(p-hydroxyphenyl) substituted carboxylic acids.

14365 Bis(3-thianaphthenoyl)Furoxan. David A. Shirley, Benjamin H. Gross, and Morris J. Danzig. *Journal of Organic Chemistry,* v. 23, July 1958, p. 1024-1026.

The action of nitric acid on 3-acetylthianaphthene in acetic acid solvent leads to a product shown to be bis(3-thianaphthenoyl) furoxan.

14366 Preparation and Physical Properties of Sulfur Compounds Related to Petroleum. IX. 7-Thiabicyclo[2.21] heptane and 6-Thiabicyclo[3.1.1]heptane. Stanley F. Birch, Ronald A. Dean, and Neville J. Hunter. *Journal of Organic Chemistry,* v. 23, July 1958, p. 1026-1030.

14367 Olefinic Derivatives of 2,4-Diamino-*s*-Triazines. Leo S. Luskin, Peter L. de Benneville, and Sidney Melamed. *Journal of Organic Chemistry,* v. 23, July 1958, p. 1032-1037.

The reaction of N-alkylaminoalkyl vinyl ethers with cyanogen chloride gave the corresponding cyanamides. Amidonitriles containing vinyl ether or methacryloyl groups were obtained respectively by the successive cyanoalkylation and acylation of aminoethyl vinyl ether or the reaction of aminonitriles with methacrylolyl chloride. Condensation of these cyanamides or amidonitriles with dicyandiamide gave the related derivatives of 2,4-diamino-*s*-triazine, a new group of triazines which undergo addition polymerization.

14368 Purification and Properties of Pyrrole, Pyrrolidine, Pyridine, and 2-Methylpyridine. R. Vernon Helm, W. J. Lanum, G. L. Cook, and J. S. Ball. *Journal of Physical Chemistry,* v. 62, July 1958, p. 858-862.

Precautions necessary in the purification are described, including protection from water and O.

14369* (French.) Szilard-Chalmers Effect on Brominated Derivatives. **L'effet szilard-chalmers sur les dérivés bromés. II.** Chemical Effect of Irradiation of Para-Dibromobenzene in a Nuclear Reactor. **Les effets chimiques de l'irradiation du para-dibromobenzène dans un réacteur nucléaire.** R. Henry, C. Aubertin, and J. Valade. *Journal de Physique et le Radium,* v. 19, no. 5, May 1958, p. 548-551.

According to the magnitude of neutron and γ fluxes, the abundances of free, oxidized, or reduced radio-bromine and of bromine recombined in benzenic or aliphatic compounds vary to a wide range.

14370 The Structure of Jatamanshie Acid. G. R. Chaudhry, M. M. Dhar, Nitya Anand, and M. L. Dhar. *Journal of Scientific & Industrial Research,* v. 17, sec. B, Apr. 1958, p. 159-162.

Proposed structure is based on chemical degradation, nuclear magnetic resonance, and ultraviolet and infrared absorption studies.

14371 Studies on the Dependence of Optical Activity on Chemical Constitution. L. Camphor-β-Sulphonyl Derivatives of Benzidine, Tolidine, Dianisidine, 4,4'-Diaminodiphenyl Methane & 4,4'-Diaminodiphenyl Sulphone. Bawa Kartar Singh and Shiva Mohan Verma. *Journal of Scientific & Industrial Research,* v. 17, sec. B, May 1958, p. 179-183.

The rotatory dispersion of products obtained by condensing camphor-β-sulphonyl chloride (*d* and *dl*-) with benzidine, tolidine, dianisidine, 4,4'-diaminodiphenyl methane and 4,4'-diaminodiphenyl sulfone was determined for 13 wavelengths in the visible region of the spectrum.

14372 Studies in Potential Antimycobacterial Agents. XIV. Synthesis of *P*-Alkylamino- P'-Amino-o,*m* & *m'*-Methoxy & Hydroxy & *m,m'*-Dimethoxy & Dihydroxydiphenyl Sulfones. J. K. Tandon, G. N. Vyas, and Nitya Anand. *Journal of Scientific & Industrial Research,* v. 17, sec. B, May 1958, p. 192-198.

The antitubercular activity of some of these compounds is discussed.

14373* Name Reactions in Organic Chemistry. Alexander R. Surrey. 192 pp. 1954. Academic Press, New York. (QD73 Su78n Ref.)

Many reactions in organic chemistry are designated by the names of the chemists who discovered or developed them. A description of each such reaction is presented, including its scope, applicability, limitations, and pertinent recent developments.

14374* (English.) **A Reaction of Cellulose Nitrate With Butylamine, and the Reaction Product.** Ermo Kaila. *Paperi ja Puu*, v. 40, no. 6, 1958, p. 339-340.

Cellulose nitrate has a fast reaction with *n*-butylamine, and immediately goes into solution. Some reactions and infrared spectra make it clear that in the reaction product, precipitated with acid, there are both nitrate and amino groups.

14375 Phenolic Resin Chemistry. N. J. L. Megson. 323 pp. 1958. Academic Press, New York. (QD341.P5 M47p)

The emphasis is on pure chemical investigations; technological aspects have been virtually ignored. Detail of presentation is stressed.

14376 Synthesis of Hydrocarbons in the Gasoline Range, 1938-1953. Cecil E. Boord, editor. 261 pp. 1953. American Petroleum Institute, New York. (QD305.H5 Am35sh Over.)

Contains the reprints of scientific papers published by the American Petroleum Institute Research Project for the Synthesis, Purification and Properties of Hydrocarbons of Low Molecular Weight, otherwise known as APIRP-45.

14377 The Irradiation Chemistry of Cyclohexanone. William F. Serat and James F. Mead. *U. S. Atomic Energy Commission, UCLA*-428, July 7, 1958, 20 pp. (UF767 Un3.-uc Contin.)

In an attempt to elucidate the action of ionizing radiation on substances present in the skin lipids, the irradiation of ergosterol was studied. The complexity of changes induced in this molecule have led to an attempt to study portions of the molecule separately. A study of the irradiation chemistry of cyclohexanone was therefore initiated.

14378* (Polish.) On the Application of the Radioisotope C^{14} in the Investigations of Chemical Transformations of the Organic Compounds. **O zastosowaniu radioaktywnego izotopu węgla C^{14} w badaniu przemian chemicznych substancji organicznych.** Jerzy Sykulski. *Wiadomosci Chemiczne*, v. 12, Apr. 1958, p. 193-206.

Examples are given of the application of the C^{14} isotope in resolving different problems e.g., in elucidation of the reaction mechanism. Particularly substitution and elimination reaction in cyclic compounds are discussed.

See also: **14317** (petroleum oils); **14738** (structure code for organic compounds); **14769** (fraction collector).

CHEMISTRY—PHYSICAL

14379* (Romanian.) Electrometircal Study of Mixed Silver and Thallium Pyrophosphate. **Studiul electrometric al pirofosfatului mixt de argint şi taliu.** C. Dragulescu and P. Tribunescu. *Academia Republicii Populare Romine. Baza de Cercetări Ştiinţifice Timişoara. Studii şi Cercetări Ştiinţifice. Seria Stiinţe Chimice*, v. 4, nos. 3-4, July-Dec. 1957, p. 9-17.

An $AgNO_3$ and $TlNO_3$ mixture, with ratio $Tl+:Ag+ = 1$, was treated with a $Na_4P_2O_7$ solution. The $Ag_3TlP_2O_7$ formed was stable in the air and sensitive to light. It did not dissolve easily in water and did not dissolve in organic solvents.

14380 Advances in Catalysis and Related Subjects. D. D. Eley, W. G. Frankenburg, and V. I. Komarewsky, editors. v. X. 326 pp. 1958. Academic Press, New York. (QD501 A95c Vis.)

Strives to bring together the diverse concepts, investigations, and studies which constitute current knowledge in the field of catalysis. Review includes crystal face inspection, infrared surface techniques, and kinetics of catalytic dehydrogenation.

14381* Chemical Thermodynamic Properties of Materials. *Air Conditioning, Heating, and Ventilating*, v. 55, Aug. 1958, p. 95.

The National Bureau of Standards, with support by the AEC, is compiling data on the chemical thermodynamic properties of many materials. The object is to present, in convenient tabular form, a critical summary of the thermodynamic information available on each chemical substance over as wide a temperature range as possible.

14382* (Ukranian.) Electronic Phenomena on a Germanium Surface on Adsorption and Catalysis. **Elektronni iavisheha na poverkhni germaniiu pri adsorbtsii ta katalizi.** G. P. Romanova and I. I. Stepko. *Akademila Nauk Ukrains'koi RSR, Dopovidi*, 1958, no. 6, p. 585-587.

Change in the work function of Ge samples was studied under different conditions. These conditions were: the adsorption of CO, the catalytic oxidation of CO in a mixture of CO and O_2, as well as the adsorption and decomposition of the formic acid vapors.

14383 Heterogeneous Phase Equilibria of the Methane—Hydrogen Sulfide System. James P. Kohn and Fred Kurata. *A.I.Ch.E. Journal*, v. 4, no. 2, June 1958, p. 211-217.

Apparatus and procedures were employed at temperatures in the range of −300 to 300 F and at pressures up to 2000 lb./sq. in. abs. The vapor-liquid, vapor-solid, liquid-solid, liquid-vapor-solid, liquid-liquid-vapor, and liquid-liquid-solid phase border curves were determined for six mixtures of CH_4 and H_2S.

14384 Cis, Trans Isomerization of Conjugated Linoleates by Iodine and Light. W. E. Tolberg and D. H. Wheeler. *American Oil Chemists' Society, Journal*, v. 35, Aug. 1958, p. 385-388.

A study of the equilibration of three isomeric conjugated linoleates, a *cis*-10, *cis*-12; a *cis*-10, *trans*-12; and a *trans*-10, *trans*-12 *isomer*.

14385 Solubilization—A Micellar Phenomenon. Jay C. Harris. *American Oil Chemists' Society, Journal*, v. 35, Aug. 1958, p. 428-435.

The ability of dilute surfactant solutions to solubilize water-insoluble substances to form stable systems is termed solubilization. Reviewed are the mechanism, methods for measurement, and temperature effect. Discussed in detail are surfactant structure and solubilizates, and the principles of solubilization involved.

14386* (English.) **Evidence of Chemical Shifts of the Inner Electronic Levels in a Metal Relative to Its Oxides (Cu, Cu_2O, CuO).** Carl Nordling, Evelyn Sokolowski, and Kai Siegbahn. *Arkiv för Fysik*, v. 13, no. 5, 1958, p. 483-500.

Energies were studied by means of magnetic analysis of X-ray produced photo electrons.

14387* Chemistry of Polynuclear Compounds. II. The Behaviour in Concentrated Sulphuric Acid Solution and Absorption Spectra of Some Polynuclear Quinones. III. The Structures and Absorption Spectra of 1,1'-Dianthrimide and Indanthrone. R. A. Durie and J. S. Shannon. *Australian Journal of Chemistry*, v. 2, no. 2, May 1958, p. 168-199.

In an investigation into the coking mechanism of coal, polynuclear quinones were adopted as models.

14388 Using Contact Resistance to Measure Adsorption of Gases on Metals. P. Kisliuk. *Bell System Technical Journal*, v. 37, no. 4, July 1958, p. 925-949.

The contact resistance between electrodes of Mo and W is used to investigate the adsorption of N and O. It is found that, on clean metals, the initial period of fast adsorption gives rise to a surface resistivity of about 4×10^{-10} ohm-cm^2, corresponding to a layer of the order of 1.6 A. thick on each surface. To remove, within a minute or so, the layers resulting from adsorption beyond this initial period, temperatures near 1700 K are required for all four metal-gas combinations.

14389 Determining Viscosity of Liquefied Gaseous Hydrocarbons at Low Temperatures and High Pressures. G. W. Swift, J. A. Christy, A. A. Heckes, and F. Kurata. *Chemical Engineering Progress*, v. 54, June 1958, p. 47-50.

Construction and operation of an apparatus for the determination of liquid viscosities of normally gaseous hydrocarbons.

14390 Chemical Action of Ionising Radiations in Solution. XXII. The Radiation Chemistry of Arsenite Solutions: the Action of X-Rays (200 kv) on Aqueous Solutions of Arsenite. M. Daniels and J. Weiss. *Chemical Society, Journal*, 1958, July, p. 2467-2471.

Investigation was over a wide range of pH. A mechanism is proposed to account for the initial yields in acid solution, for the variation of initial yields with pH, and for the dependence of the yield on radiation dose.

14391 The Heat of Solution of Plutonium Trichloride. P. E. Martin and A. G. White. *Chemical Society, Journal*, 1958, July, p. 2490-2492.

Measurements took place in aqueous perchloric acid and in perchloric acid-lithium perchlorate solutions at constant ionic strength. Results provide evidence for the formation of a chloride complex by the tervalent plutonium ion, and an approximate value for the change of heat content accompanying its formation has been calculated.

14392 Evidence for the Existence of Hydrogen Dichloride Ions, HCl_2^-, in Organic Compounds. D. W. A. Sharp. *Chemical Society, Journal*, 1958, July, p. 2558-2562.

The adducts formed by the action of HCl on chlorotri-*p*-methoxyphenylmethane and 9-chloro-9-phenylxanthen have been examined by infrared and ultraviolet spectroscopy. The conditions for formation of carbonium hydrogen dichlorides discussed suggest that these anions may play an important part in organic reaction mechanisms.

14393* (Czech.) Vibrational Spectra of Some Halogenated Silanes. **Vibrační spektra některých halogenderivátů silanu. II.** Vibrational Spectra of Trichlorohalogen Silanes. **Vibrační spektra trichlorhalogensilanů.** Jan Štokr and Bohdan Schneider. *Chemické Listy*, v. 52, no. 6, June 1958, p. 985-995.

Raman spectra of $SiCl_4$, $SiFCl_3$, $SiBrCl_3$, $SiICl_3$, and infrared spectra of the $SiFCl_3$, $SiBrCl_3$, $SiICl_3$ molecules in the region between 450 and 2000 cm^{-1}.

14394* (Czech.) Thermal Decomposition of Manganese (II) Carbonate. **Termický rozklad uhličitanu manganatého. II.** Studies Using Electron Microscopy. **Elektronově mikroskopické studie.** Miroslav Rozsíval and Arnošt Bergstein. *Chemické Listy*, v. 52, no. 6, June 1958, p. 1011-1014.

Change of the crystal shape and of the size of the particles in decomposed products of $MnCO_3$ annealed in the form of partly thin, partly thick small pressed plates, in the air at temperatures from 200 to 1300 C.

14395* (Czech.) Chromatography of Aromatic Isomers. **Chromatografie aromatických isomerů. IX.** Separation of Some Benzene Mono- and Tricarboxylic Acids by Paper Chromatography. **Dělení některých benzenmono- a trikarbonových benzenmono- a trikarbonových kyselein papírovou chromatografii. X.** Energy of the Intramolecular Hydrogen Bond in Amino- and Hydroxyanthraquinones. **Energie vnitřní vodíkové vazby amino- a hydroxyanthrachinonů.** Jaroslav Franc. *Chemické Listy*, v. 52, no. 6, June 1958, p. 1108-1119.

14396 The Polarographic Reduction of Organic Halogen Compounds: Steric Hindrance and the Polarographic Reduction Potential. F. L. Lambert and Kunio Kobayashi. *Chemistry & Industry*, 1958, no. 30, July 26, p. 949-950.

Evidence of steric influence on the polarographic half-wave potential in compounds which do not exhibit steric hindrance under the conventional reaction conditions of S_N2 displacements was found.

14397 The Mobilities of the Ions in Fused KNO_3-$AgNO_3$ Mixtures. F. R. Duke and Boone Owens. *Electrochemical Society, Journal*, v. 105, Aug. 1958, p. 476-477.

The mobilities of the three ions in fused KNO_3-$AgNO_3$ mixtures were determined as a function of composition. The mobility of the nitrate ion is insensitive to composition changes; the cations, however, tend toward the mobility of the main constituent cation at each end of the composition scale. Temperature variation has no significant effect on the transport numbers of these ions.

14398 Estimation of Thermodynamic Properties of Organic Compounds. George J. Janz. 211 pp. 1958. Academic Press, New York. (QD511 J26e)

Proceeds from an introductory account of the calculation of free energy changes to the use of the results as a criterion of the thermodynamic stability and feasibility of the process considered. Numerical examples are given to guide the application of the procedures in practice.

14399 The Second Virial Coefficient of Boron Trifluoride + Nitrogen Mixtures. G. L. Brooks and C. J. G. Raw. *Faraday Society, Transactions*, v. 54, pt. 7, July 1958, p. 972-974.

An investigation of the second virial coefficient of BF_3 and of mixtures of BF_3 and N at 30 C and various concentrations.

14400 The Mercury-Photosensitized Oxidation of Hydrocarbons. R. H. Burgess and J. C. Robb. *Faraday Society, Transactions*, v. 54, pt. 7, July 1958, p. 1015-1025.

The method of determining the rate of a chemical reaction by measurement of the temperature rise in the gas on irradiation with 2537 Å ultraviolet light is applied to an investigation of the chain oxidation of six hydrocarbons (*n*-pentane, *n*-hexane, *n*-heptane, *iso*butane, cyclohexene, and cumene) in the temperature range 0-400 C.

14401 The Rate of Electrolytic Hydrogen Evolution and the Heat of Adsorption of Hydrogen. Roger Parsons. *Faraday Society, Transactions*, v. 54, pt. 7, July 1958, p. 1053-1063.

The relation between the exchange current for electrolytic H evolution and the ability of the electrode to adsorb atomic H is discussed. Once this relation is established the complete current-voltage curve can be calculated for a metal, given the standard free energy of adsorption of H upon it.

14402 Structural and Ion Sieve Properties of a Synthetic Crystalline Exchanger. R. M. Barrer and W. M. Meier. *Faraday Society, Transactions*, v. 54, pt. 7, July 1958, p. 1074-1085 + 2 plates.

Exchanges involving the inorganic ions Li+, K+, Tl+, NH_4^+, Ca^{2+}, Sr^{2+}, Ba^{2+}, Mg^{2+}, Zn^{2+}, Pb^{2+} Ni^{2+}, and Co^{2+} were carried out using a new synthetic zeolite. Various ion-sieve and spatial limitation phenomena were observed both for the organic and the inorganic ions.

14403* (Japanese.) **Rate of Methanol Synthesis.** Hiroshi Uchida and Yoshisada Ogino. *Government Chemical Industrial Research Institute, Tokyo, Reports*, v. 53, Apr. 1958, p. 135-145.

Measurements of methanol synthesis in wide ranges of pressure, temperature, ratio of H to CO, and space velocity were carried out.

14404* The Crystal Structure of p-Azo-Toluene $(CH_3\text{-}C_6H_4N)_2$. V. M. Padmanabhan, Jagdish Shankar, and P. G. Khubchandani. *Indian Academy of Sciences, Proceedings*, v. 67, sec. A, no. 5, May 1958, p. 323-328.

Gives the complete structure by X-ray diffraction studies.

14405 Reaction of Nitric Oxide With Activated Carbon and Hydrogen. G. Bedjai, H. K. Orbach, and F. C. Riesenfeld. *Industrial and Engineering Chemistry*, v. 50, Aug. 1958, p. 1165-1168.

Elimination of nitrogen oxides from the atmosphere should be an effective means of smog abatement. Concentrations of nitric oxide of the order of 5000 p.p.m. may be quantitatively removed from an inert gas by reaction with activated C at 700 C and a space velocity of 1500 $hr.^{-1}$, and with H on a C catalyst at about 600 C and a space velocity of 1500 $hr.^{-1}$.

14406 Diffusion of Gases in Porous Media. R. F. Dye and J. M. Dallavalle. *Industrial and Engineering Chemistry*, v. 50, Aug. 1958, p. 1195-1200.

An investigation of countercurrent diffusion. Cylindrical plugs 1½-in. in diameter, pressed dry from powdered $KClO_4$ in lengths of 1,2,4, and 8-in. of known porosity, were studied using CO_2 and N as the diffusing gases.

14407 Solubility Relationships in Hydrogen Peroxide Solutions Containing Pyrophosphate and Stannate Inhibitors. G. C. Hood, R. J. Evans, and G. J. Pierotti. *Industrial and Engineering Chemistry*, v. 50, Aug. 1958, p. 1211-1212.

14408* (English.) **The Radiation Chemistry of Gases.** Paul Harteck. *Industrie Chimique Belge*, v. 23, no. 6, June 1958, p. 579-588.

New techniques and novel reaction mechanisms have been applied to the study of the radiation chemistry of gases, specifically mixtures of N and O and the nitrogen oxides.

14409 Adsorption of Oxygen and Carbon Monoxide on Tungsten. R. E. Schlier. *Journal of Applied Physics*, v. 29, Aug. 1958, p. 1162-1167.

At a temperature of 300 K the adsorption was measured by means of the flash filament technique. An omegatron R.F. mass spectrometer was used to measure pressure. It is shown that O pressures cannot be measured satisfactorily with ionization gages of the hot W-filament type.

14410 Substituted Methanes. XXVIII. Infrared Spectra Data and Assignments for $CHCl_2F$ and $CHClF_2$ and Potential Energy Constants and Calculated Thermodynamic Properties for $CHCl_2F$, $CDCl_2F$, $CHClF_2$, and $CDClF_2$. Herman B. Weissman, Arnold G. Meister, and Forrest F. Cleveland. *Journal of Chemical Physics*, v. 29, July 1958, p. 72-77.

14411 Infrared Spectra of the Alkaline-Earth Halides. I. Beryllium Fluoride, Beryllium Chloride, and Magnesium Chloride. Alfred Büchler and William Klemperer. *Journal of Chemical Physics*, v. 29, July 1958, p. 121-123.

14412 Nonstoichiometry in Uranium Dioxide. S. Aronson and J. Belle. *Journal of Chemical Physics*, v. 29, July 1958, p. 151-158.

A thermodynamic study of the U-O system, primarily in the single phase region UO_2-$UO_{2.20}$, was made at temperatures from 1150 to 1350 K. Partial molar free energies, entropies, and enthalpies of solution of O in UO_{2+x} were calculated. Equations relating the thermodynamic quantities to the degree of nonstoichiometry were developed.

14413 Absorption Spectra of Some 1-Dehydro Corticosteroids in Concentrated Sulfuric Acid. Leland L. Smith and Walter H. Muller. *Journal of Organic Chemistry*, v. 23, July 1958, p. 960-963.

A correlation between selective absorption in concentrated H_2SO_4 is found.

14414 The Vaporization of Molybdenum and Tungsten Oxides. Paul E. Blackburn, Michael Hoch, and Herrick L. Johnston. *Journal of Physical Chemistry*, v. 62, July 1958, p. 769-773.

Vapor pressures above MoO_3, Mo_4O_{11}, MoO_2, WO_3, and WO_2 were measured by the Knudsen effusion method.

14415 The Dielectric Relaxation Times of Some Amines, Dimethylthianthrene, Dibenzothiophene, Triphenylphosphine, and Triphenylarsine. A. H. Price. *Journal of Physical Chemistry*, v. 62, July 1958, p. 773-777.

With the exception of tribenzylamine the molecules studied appear to be essentially rigid.

14416 The Entropy of Fusion of Long Chain Hydrocarbons. R. H. Aranow, L. Witten, and Donald H. Andrews. *Journal of Physical Chemistry*, v. 62, July 1958, p. 812-816.

The entropy of fusion of heavy paraffins yields information concerning the rotational energy levels of the molecules.

14417 The Hydrogenation of Benzene Over Copper-Nickel Alloys. W. Keith Hall and P. H. Emmett. *Journal of Physical Chemistry*, v. 62, July 1958, p. 816-821.

Carried out with a view to providing data for critical tests of theories relating catalytic activity to properties of the solid state.

14418 Cryoscopy of the LiCl-KCl Eutectic Melt Containing Alkali Halides and Alkali Titanium Fluorides as Solutes. G. J. Janz, et al. *Journal of Physical Chemistry*, v. 62, July 1958, p. 823-826.

Reports cryoscopic behavior of NaCl, LiF, NaF, KF, Li_2TiF_6, Na_2TiF_6, and K_2TiF_6 in the LiCl-KCl eutectic melt.

14419 Volume Effects on Mixing in the Liquid Bi-$BiCl_3$ System. F. J. Keneshea, Jr. and Daniel Cubicciotti. *Journal of Physical Chemistry*, v. 62, July 1958, p. 843-847.

A pycnometric method was used for the density measurements. There is a decrease in the total volume of the system on mixing.

14420 Solubility of Noble Gases in Molten Fluorides. I. In Mixtures of NaF-ZrF_4 (53-47 Mole %) and NaF-ZrF_4-UF_4 (50-46-4 Mole %). W. R. Grimes, N. V. Smith, and G. M. Watson. *Journal of Physical Chemistry*, v. 62, July 1958, p. 862-866.

Solubilities of He, Ne, Ar, and Xe were determined at pressures from 0.5 to 2 atm. in NaF-ZrF_4 at 600, 700, and 800 C.

14421* (French.) Infrared Absorption Spectra of Benzenocarboxylic Acids. Attribution of Vibrational Modes to Recorded Bands. **Spectres d'absorption infrarouge des acides benzénocarboxyliques. Attribution des modes de vibration aux bandes enregistrées.** Antonia Hidalgo and F. Gonzalez-Sanchez. *Journal de Physique et le Radium*, v. 19, no. 5, May 1958, p. 536-540.

Infrared absorption spectra of the twelve benzenocarboxylic acids are recorded. The substances were investigated in the solid state by the KBr pellets method.

14422* (German.) Thermodiffusion of Macromolecules in a Solution. **Thermodiffusion von Makromolekülen in Lösung.** G. Langhammer. *Journal of Polymer Science*, v. 29, June 1958, p. 505-518.

Disintegration coefficients of macromolecular substances were measured in different solvents by the thermal diffusion method. The systems investigated were: polyvinylpyrrolidone in water and alcohol; polystyrene in toluene and some other solvents; polyvinyl acetate in toluene and other solvents.

14423* Relative Strengths of Forty Aromatic Carboxylic Acids in Benzene at 25° C. Marion Maclean Davis and Hannah B. Hetzer. *Journal of Research, National Bureau of Standards*, v. 60, no. 6, June 1958, p. 569-592.

Measurements were performed spectrophotometrically, using the indicator acid bromophthalein magenta E as the reference acid.

14424 Kinetics of the Olefine-Bromine Reaction. X. Influence of Products on the Kinetics of Bromine Addition to Unsaturated Acids. XI. Influence of Lithium Bromide & Chloride on the Addition of Bromine to α,β-Unsaturated Acids. I. M. Mathai. *Journal of Scientific & Industrial Research*, v. 17, sec. B, Apr. 1958, p. 145-152.

14425 Radioactive Tracer Study of the Adsorption of Phosphate Ions by Aluminium Oxide. K. R. Kar. *Journal of Scientific & Industrial Research*, v. 17, sec. B, May 1958, p. 175-178.

The exchange kinetics of these ions between phosphatized (tagged with P^{32}) Al_2O_3 and inactive sodium phosphate in solution, and solid aluminum phosphate (tagged with P^{32}) and inactive sodium phosphate in solution were studied. It is concluded that the adsorption of phosphate ions on Al_2O_3 is different from the chemical binding between aluminum and phosphate radicals in solid aluminum phosphate.

14426* Proton Magnetic Resonance of Aromatic Carbonium Ions. I. Structure of the Conjugate Acid. C. MacLean, J. H. van der Waals, and E. L. Mackor. *Molecular Physics*, v. 1, no. 3, July 1958, p. 247-256.

N. M. R. spectra of aromatic carbonium ions obtained by dissolving highly basic aromatic hydrocarbons in $CF_3COOH + H_2O \cdot BF_3$ or $HF + BF_3$ were measured. The resonance of the protons in the CH_2 group in the carbonium ion was detected. This configuration has an "aliphatic" character.

14427 Physico-Chemical Effects of Pressure. S. D. Hamann. 246 pp. 1957. Academic Press, New York. (QC281 H17p)

Surveys the effects of pressure in the field of physical chemistry, and is concerned with changes brought about by pressures usually above a hundred atmospheres.

14428* Cluster Theory of Condensing Systems. Kazuyosi Ikeda. *Progress of Theoretical Physics*, v. 19, no. 6, June 1958, p. 653-698.

A detailed and rigorous theory of vapor-liquid coexistence in the condensation of a system consisting of a very large number of interacting molecules.

14429* (Polish.) The Solubility of Hydrogen Chloride in Some Chlorohydrocarbons. **Rozpuszczalność chlorowodoru w niektórych chlorowęglowodorach.** Antoni Zb. Zieliński. *Przemysł Chemiczny*, v. 37, no. 5, May 1958, p. 338-339.

The solubility of HCl was determined in ethylene chloride, tetrachloroethane, chloroform, and CCl_4 at temperatures of 20, 30, and 40 C.

14430* Magnetism and the Shape of Transition Metal Complexes. Ronald S. Nyholm. *Record of Chemical Progress*, v. 19, no. 2, 1958, p. 45-60.

A discussion of the use which can be made of magnetic susceptibility measurements as a guide to the stereochemistry of metal complexes, in particular, those of the transition metals.

14431 Perturbation Effects Due to Hydrogen Bonding in Physical Adsorption Studied by Length-Change and Infra-Red Techniques. M. Folman and D. J. C. Yates. *Royal Society, Proceedings*, v. 246, ser. A, July 22, 1958, p. 32-51.

14432 Relative Raman Intensities of the Totally Symmetrical Vibrations of the Tetramethyls of Carbon, Silicon, Germanium, Tin and Lead in the Vapour State. D. N. Waters and L. A. Woodward. *Royal Society, Proceedings*, v. 246, ser. A, July 22, 1958, p. 119-132.

Frequency-corrected relative intensities excited by the blue and violet mercury lines show satisfactory agreement. The intensity of the mode consisting principally of symmetrical methyl deformation is too low to be observed for $C(CH_3)_4$, but increases (relative to the intensity of the C-H stretching mode) as the central carbon atom is progressively replaced by Si, Ge, Sn, and Pb.

14433 The Decomposition of Silver Azide. B. E. Bartlett, F. C. Tompkins, and D. A. Young. *Royal Society, Proceedings*, v. 246, ser. A, July 29, 1958, p. 206-216.

The thermal decomposition of both allotropic forms of AgN_3 as polycrystalline material and as single crystals.

14434 Second International Congress of Surface Activity, Proceedings. v. I. Gas/Liquid and Liquid/Liquid Interface. v. II. Solid/Gas Interface. v. III. Electrical Phenomena and Solid/Liquid Interface. v. IV. Solid/Liquid Interface (Washings, Etc.) and Cell/Water Interface. 521, 348, 621, and 352 pp. 1957. Academic Press, New York. (QD506 In8p)

14435* (English.) **Kinetics of Oxidation of Lactose by Alkaline Bivalent Copper in Presence of Rochelle's Salt. VI.** Mathura Prasad Singh. *Zeitschrift für Physikalische Chemie* (Leipzig), v. 208, nos. 5/6, Apr. 1958, p. 265-272.

Oxidation of lactose was studied in order to confirm the hypothetical formation of enediol. The reaction velocity is enhanced by increasing the concentration of alkali as well as by pre-treating the sugar with alkali as in the case of other reducing sugars.

14436* (English.) **Mechanism of Chromic Acid Oxidations. VIII. Oxidation of Propylene Glycol, 2:3 Butylene Glycol, and Pinacol by Chromic Acid.** A. C. Chatterji and S. K. Mukherjee. *Zeitschrift für Physikalische Chemie* (Leipzig), v. 208, nos. 5/6, Apr. 1958, p. 281-292.

A kinetic study. On the basis of results a possible mechanism was suggested for the oxidation of ethylene and methylated ethylene glycols in general.

14437* (English.) **Reduction of Permanganate by Oxalate. III. Anticatalytic Action of Bivalent Manganese and Reaction Mechanism.** Y. K. Gupta and S. Ghosh. *Zeitschrift für Physikalische Chemie* (Leipzig), v. 208, nos. 5/6, Apr. 1958, p. 368-374.

14438* (Russian.) Phase Equilibria in Systems Containing Ethylene and Tetrachloroalkanes. **Fazovye ravnovesiia v sistemakh soderzhashchikh etilen i tetrakhloralkany.** G. D. Efremova and P. F. Kovpakova. *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 6, June 1958, p. 1231-1240.

The solubility of ethylene in tetrachloroalkanes was studied at temperatures from 0.2 to 100 C. Critical liquid-gas phenomena were observed. Critical pressure grows with increasing temperature and the length of the tetrachloroalkane chain. In the systems ethylene-tetrachloropentane, ethylene-tetrachloroheptane, and ethylene-tetrachlorononane, there exists not only liquid-gas, but also liquid-liquid equilibrium. The liquid-liquid equilibrium also ends at the critical point. In the system ethylene-tetrachloropheptane, a study was made of the transition of the system from the region of the three-phase liquid-liquid-gas equilibrium to the two-phase liquid gas. This system belongs to a rare class in which the three-phase liquid-liquid gas equilibrium exists also at temperatures above the critical for the most volatile component.

See also: **14291** (science of high explosives); **14739** (diffusion of gases, liquids, and solids, in solids, bibliography); **15266** (physical chemistry of polymers).

COATINGS

14439 Automatic Application of Special Brick Coatings. R. J. Verba. *American Ceramic Society Bulletin*, v. 37, Aug. 1958, p. 364-365.

A general description of the equipment for application of special coatings to structural clay products. Both wet and dry processes are covered.

14440 Evaluation of the Thermal Insulative Characteristics of Ceramic Coatings. W. J. Plankenhorn. *American Ceramic Society Bulletin*, v. 37, Aug. 1958, p. 366-369.

A differential thermocouple technique is described.

14441 On the Adherence of Porcelain Enamel to Sheet Steel. Jan Berk and Jan de Jong. *American Ceramic Society, Journal*, v. 41, Aug. 1958, p. 287-293.

Studies the reactions at the interface of enamels and steel during firing with a reflecting microscope, electron microscope, X-ray spectrometer, and a light spectrograph.

14442* Recent Developments in the Chemical Finishing of Textiles. Fred Fortess. *American Dyestuff Reporter*, v. 47, no. 15, July 28, 1958, p. P513-P522.

Discusses a number of specific chemical-finishing treatments to show how a wide variety of fabric properties may be modified or improved for a particular end use. Silicone and alkaline treatments are examples.

14443 Plant-Applied Silicones Can Increase Sales. B. C. Carlson. *Brick & Clay Record*, v. 133, no. 1, July 1958, p. 45 + 5 pages.

Dow-Corning Silaneal 772 can be applied by spray or dip methods to fired brick; can keep brick clean, efflorescence-free, improve suction rate; costs 50 cents per thousand.

14444* Ships' Paints' Faults. H. Courtney Bryson. *Corrosion Prevention and Control*, v. 5, no. 7, July 1958, p. 47-52.

14445 Ships' Bottom Paints in Relation to Cathodic Protection. T. A. Banfield. *Corrosion Technology*, v. 5, Aug. 1958, p. 243-246.

Design of the installations, including type and composition of anode materials, number, size, shape, and position of anodes.

14446 Developments in Ships' Protective Coatings. F. Perkins. *Corrosion Technology*, v. 5, Aug. 1958, p. 247-249.

Marine corrosion involves most of the known classical situations of the electrochemical theory of corrosion, and is primarily concerned with a metal immersed in an electrolyte.

14447 Automatic Galvanising Plant. *Engineering*, v. 186, July 18, 1958, p. 78-79.

The Armco-Sendzimir installation at Ebbw Vale is described.

14448 The Protective Coatings Industry Matures. Allen L. Alexander. *Industrial and Engineering Chemistry*, v. 50, Aug. 1958, p. 52A-55A.

Accumulation of fundamental information has made possible remarkable advances in coating technology.

14449* Hard Oxide Coatings on Aluminium Investigated. *Industrial Finishing (London)*, v. 10, July 1958, p. 36-37.

Effects of hard oxide coatings on the properties of Al and its alloys.

14450* Application of Vitreous Enamels to Non-Porous Surfaces. A. H. Symonds. *Industrial Finishing (London)*, v. 10, July 1958, p. 47-49.

14451* Automatic Metal Spraying of Precision Parts. *Industry & Welding*, v. 31, Aug. 1958, p. 40-41.

Thompson Products' set-up is examined.

14452 Organic Coatings for Zinc Surfaces. P. Costelloe and E. Pace. *Institute of Metal Finishing, Bulletin*, v. 8, no. 2, Summer 1958, p. 107-114.

Evaluation of many current commercial paint resins and their performances on Zn surfaces. Primers and wash primers; effect of certain pigments; formulation of coatings; performance of chromate and phosphate passivation.

14453 Fire Hazards and Their Avoidance in Organic Finishing. L. A. Smith. *Institute of Metal Finishing, Bulletin*, v. 8, no. 2, Summer 1958, p. 115-128.

Fire hazard of flammable liquids and vapors is described and tables give the fire properties of common solvents, oils susceptible to spontaneous heating, and ventilation requirements in evaporating ovens for various solvents.

14454 Moisture-Vapor Transmission Testing. Frances M. Corney. *Instruments and Automation*, v. 31, July 1958, p. 1201.

Procedure with the General Foods device (G.F.M.V.T.) is outlined.

14455* (German.) Use of Polyethylene Coated Filter Pipes in Well Construction. **Polyäthylen-beschichtete Filterrohre im Brunnenbau.** Thomas Engel. *Kunststoffe*, v. 48, July 1958, p. 348-350.

A method is described whereby steel pipes of different types are coated with polyethylene which is both mechanically strong and adheres well to the metal pipe.

14456 A Guide to Materials Standards and Specifications. VI. Finishes and Coatings. S. P. Kaidanovsky. *Materials in Design Engineering*, v. 48, Aug. 1958, p. 101-103.

14457* The Role of Pigments in the Weathering of Automotive Paints. Sumner B. Twiss, William L. Weeks, and F. O. Thomas. *Official Digest*, v. 30, Aug. 1958, p. 788-823.

The effects of outdoor weathering in Southern Florida for one yr. on clear and pigmented alkyd-melamine formulations was investigated with light and electron microscopes.

14458* Fundamentals of Formulation of Interior Architectural Finishes. Fred B. Stieg, Jr. *Official Digest*, v. 30, Aug. 1958, p. 824-834.

Methods are outlined for arriving at basic formulas for various types of finishes at predetermined hiding power levels.

14459* Latex Paints for Industrial Finishes. M. C. Carpenter, A. L. Cipriano, and L. K. Skory. *Official Digest*, v. 30, Aug. 1958, p. 845-859.

A new styrene-butadiene latex specially designed for use in baked metal finishes.

14460* Pigmentation Study of Alkyd Flat Paints. Robert F. Hall and Holland Bozeman. *Official Digest*, v. 30, Aug. 1958, p. 871-889.

Deals with different pigmentations of alkyd flat paints and the effects observed on different properties including reflectance, hiding power, wet to dry hiding, tinting strength, color uniformity, wet to dry color change, brushing, sheen, polishing, settling, and cost.

14461* Nonionic Surfactants in Paints. G. M. Gantz and W. G. Sumner. *Official Digest*, v. 30, Aug. 1958, p. 890-897.

Describes the above as a class with particular emphasis on alkyl phenol-ethylene oxide condensates. The preparation and properties of nonionics are reviewed.

14462 Polyester Resins for Surface Coatings: The Use of Additives for Protection Against Air Inhibition. H. W. Keenan. *Oil & Colour Chemists' Association, Journal*, v. 41, Aug. 1958, p. 563-568.

Considers some technological and economic pitfalls in polyester applications.

14463 Recent Developments in Organic Derivatives of Titanium. R. Sidlow. *Oil & Colour Chemists' Association, Journal*, v. 41, Aug. 1958, p. 577-586.

The use of Ti esters as anti-oxidants, gelation promoters, or pigment dispersing aids, is discussed, together with a summary of uses outside the surface coatings field.

14464 Tests for the Evaluation of Solvents and Diluents. N. W. Gillam. *Oil & Colour Chemists' Association, Journal*, v. 41, Aug. 1958, p. 587-598.

Shows that no one test can decide the value of a solvent or diluent, but that a range of selected tests, with knowledge of the significance of the results, can indicate the products likely to be of value and worth further examination.

14465* Progress in Methods of Applying Coatings—As Seen by the User. I. The Aircraft Industry. B. T. Graham, Jr. **II. The Furniture Industry.** Charles S. Powell. *Paint Industry Magazine*, v. 73, July 1958, p. 14 + 1 page.

Two parts of a panel discussion presented at the May 14, 1958 Meeting of the Chemical Coatings Technical Committee of the National Paint, Varnish and Lacquer Association in Chicago, Illinois.

14466 Surface Coatings Derived From Tall Oil. II. Aluminium Complexes May Provide Complete Paint Vehicles. J. Weiss. *Paint Manufacture*, v. 28, Aug. 1958, p. 243-246.

Particular attention is paid to the modification of drying times of paints and pastes. (To be continued.)

14467* New Tool for Evaluating Sagging of Paint. W. W. Reynolds and E. C. Larson. *Paint and Varnish Production*, v. 48, no. 9, Aug. 1958, p. 31-34.

14468* Silicone Resin for Cold Blends. *Paint and Varnish Production*, v. 48, no. 9, Aug. 1958, p. 38 + 2 pages.

Finds application in the formulation of Al paints and high temperature baking enamels.

14469* Silicone Release Coatings for Paper. J. W. Keil, D. L. Leedy, and L. H. Reinke. *Paper, Film and Foil Converter*, v. 32, Aug. 1958, p. 34-38.

Heat stability and incompatibility with organic materials make silicones excellent release agents.

14470* Notes on Vitreous Enamel Application Techniques. A. H. Symonds. *Product Finishing*, v. 11, July 1958, p. 48-51.

Refers to flow coating, controlled dipping, agitation, viscosity control, and roller coating.

14471* Polyester Finishes for Wood. B. M. Letsky. *Product Finishing*, v. 11, July 1958, p. 56-62.

Important advantages and the cost questions relevant to their use.

14472 Protective Coatings From Polythene Powder. *Rubber and Plastics Age*, v. 39, July 1958, p. 598-599.

By means of dip or spray coating with polythene powder, a complete protective covering can be applied in one operation to metal articles of the most complex shape.

14473 Plastic Glazings for Solar Energy Absorption Collectors. Frank E. Edlin. *Solar Energy*, v. 11, no. 2, Apr. 1958, p. 3-6.

Compares transparent plastic films with glass as glazings for solar energy absorption collectors.

14474* Plating Without Electricity Improves Corrosion Resistance. *Tool Engineer*, v. 41, no. 3, Sept. 1958, p. 109.

Electroless Ni process is simple and gives superior coatings. Recent research has shown how to increase deposition rates.

See also: **14358** (esterfication of methylolated rosin); **14712** (ink vehicles); **14835** (coatings to fight sea corrosion).

CONTROL SYSTEMS, COMPUTERS, AND SYSTEMS ENGINEERING

14475* Digital Computer Newsletter. Gordon D. Goldstein and Jean S. Campbell, editors. *Association for Computing Machinery, Communications*, v. 1, July 1958, p. 24-42.

Briefly describes computers and data processors, computing centers, computers overseas, and new components.

14476 Vanguard Control Demonstrates Minimum Hardware Approach. II. Robert H. Cushman. *Automatic Control*, v. 9, no. 1, July 1958, p. 16-20.

Describes equipment and its operations for timing and controlling the launching of the satellite, and use of IBM 704 computer simulation to unite the diverse efforts of the many analytical explorations into a single integrated approach.

14477 Automatic Process Control. Donald P. Eckman. 368 pp. 1958. John Wiley & Sons, New York. (TA165 E3a)

Treats the important principles of automatic control, emphasizing block diagrams and frequency techniques in process control. Includes new electronic controllers, control elements and actuators, non-linear elements often encountered in process control, Nyquist and Bode diagrams, fluid and thermal process control, computer optimizing control, and direct comparison of control actions.

14478* (Ukrainian.) Certain Questions of the Synthesis of Numerical Program Control Systems. **Deiaki pitannia sintezu skhem tsifrovogo programnogo upravlinnia.** B. O. Sigov. *Avtomatika*, 1958, no. 2, p. 1-11.

Deals with systems of positioning control. A criterion is proposed for determining the system satisfying the positioning principle, which is named the structural suitability indicator for positioning control systems.

14479* (Ukrainian.) Cybernetic Systems of Automatic Control With Self-Changing Adjustment. **Kibernetichni sistemi z samozminiuvanoiu ustavkoiu (nastroĭkoiu).** O. G. Ivakhnenko. *Avtomatika*, 1958, no. 2, p. 30-47.

Shows that cybernetic systems of automatic control have analogous basic arrangements.

14480* (Ukrainian.) Approximation Frequency Method for Investigating Optimalizing Impulse Regulating Systems. **Nablizhenii chastotnii metod doslidzhennia ekstremal'nikh sistem impul'snogo reguliuvannia.** V. M. Kuntsevich. *Avtomatika*, 1958, no. 2, p. 48-64.

A procedure for determining the frequency and amplitude of auto-oscillations by the frequency characteristics of the continuous part of the system.

14481 Basics of Digital Computers. John S. Murphy. v. I, II, and III. 116, 133, and 136 pp. 1958. John F. Rider, Inc., New York. (TK7888.3 M95b)

A work of three small volumes aimed to provide an easy path to a fundamental digital computer background. The subject matter has been distilled into easy-to-learn "picture book" form.

14482 Stability and Convergence Limitations on the Use of Analogue Computers With Resistance Network Analogues. M. E. Fisher. *British Journal of Applied Physics*, v. 9, July 1958, p. 288-291.

Various practical methods have been described for solving partial differential equations such as $\Delta^2\phi = f(\phi)$ by means of resistance networks coupled to electronic analogue computing units. These schemes are investigated mathematically to determine the conditions for which the computer remains stable, or for which the successive approximations converge to the required solution.

14483* Many-Valued Logical Machines. Alan Rose. *Cambridge Philosophical Society, Proceedings*, v. 54, pt. 3, July 1958, p. 307-321.

14484 New Developments in Program Controllers. E. J. Kompass. *Control Engineering*, v. 5, Sept. 1958, p. 122-127.

Many relatively new devices are described including card and tape readers with special characteristics, and machines that can read the ordinary printed page directly.

14485 Putting Logic to Work in Designing Distributed Program Control Systems. Robert A. Mathias. *Control Engineering*, v. 5, Sept. 1958, p. 139-145.

Uses examples from the batch process and machine industries to show how Boolean algebra helps in programmer design.

14486 Converting Pulse and Coded Data Into Usable Output Signals. Harry W. Mergler. *Control Engineering*, v. 5, Sept. 1958, p. 146-152.

Codes and the internal programmer networks for code conversions, data manipulation, and digital-to-analog conversion.

14487* Control Engineers' Handbook. Servomechanisms, Regulators, and Automatic Feedback Control Systems. John G. Truxal, editor. Sections separately paged. 1958. McGraw-Hill, New York. (TJ213 T77c Ref.)

Gives engineers, designers, and development engineers a basic source of information on components and techniques for use in the design of feedback control systems. Emphasizes components, including electro-mechanical, mechanical, hydraulic, and pneumatic as well as electronic and magnetic components.

14488 High-Speed Data Processing. C. C. Gotlieb and J. N. P. Hume. 338 pp. 1958. McGraw-Hill, New York. (HF5548 G71h)

The important principles and general techniques of processing data at high speeds, particularly for business purposes, are thoroughly outlined. Covers subjects, from the method of representing information in a processor to advances in automatic programming, and shows how data processors work, how they are used, and what their advantages are.

14489* Load and Frequency Control. George McKnight and John Hoag. *Instrumentation*, v. 11, no. 4, July-Aug. 1958, p. 6-11.

The design and development of a complex control system, broken down into its individual component characteristics.

14490* Basic Characteristics of Automatic Control. *Instrumentation*, v. 11, no. 4, July-Aug. 1958, p. 12-16.

The simplest mode of control that will do the job is the best one for the process.

14491 Environmental Prerequisites for Computer Efficiency. R. D. Horwitz. *Instruments and Automation*, v. 31, July 1958, p. 1204-1206.

A check list of environmental considerations for construction of a computer facility may also be of value in planning for greater efficiency and lower costs in other special-purpose rooms and departments.

14492 Mathematics and Logic for Digital Devices. James T. Culbertson. 224 pp. 1958. Van Nostrand, New York. (QA37 C89m)

Deals with algebraic topics, including permutations, combinations, and probability, as they apply to computers, followed by a detailed chapter on number systems and how they are used in computer work.

14493 Modern Computing Methods. 129 pp. 1958. Philosophical Library, New York. (QA297 G79.5m)

A brief account of those computing methods likely to be of general use. Emphasis is essentially practical and simple worked examples are included in algebraic equations and matrices, finite difference methods, ordinary and partial differential equations.

14494* Russian Automated Precision Casting Plant. Peter Trippe. *Process Control and Automation*, v. 5, Apr. 1958, p. 158-163.

Describes the Podolsk plant and illustrates some typical case studies.

14495* Problems of Random Inputs. J. F. Coales. *Process Control and Automation*, v. 5, Apr. 1958, p. 164-168.

(To be continued.)

14496* A Simplified Theory of Feedback Control Systems. P. Naslin. *Process Control and Automation*, v. 5, June 1958, p. 228-231.

(To be continued.)

14497 Design of the Perceptron. *Research & Engineering*, v. 4, July-Aug. 1958, p. 5-9.

Describes an experiment with an IBM 704 and a perceptron wherein a machine demonstrated its ability to form a spontaneous concept or idea based on its observations of visual forms and to attach symbols in a meaningful fashion to things that it sees.

14498 Solving Structural Mechanices Problems on Digital Computers. H. J. Greenberg. *U. S. Atomic Energy Commission, NYO-8670*, July 11, 1958, 52 pp. (UF767 U3ny Contin.)

This paper includes a brief description of typical medium and large size computing systems (IBM-650 and IBM-704), a list of standard mathematical problems, codes, and applications.

14499 The Themis Code: An Astronomical Numerical Integration Program for the IBM 704. Edna Vienop and Joseph L. Brady. *U. S. Atomic Energy Commission, UCRL-5242*, May 20, 1958, 33 pp. (UF767 U3u Contin.)

The Themis program is designed as a general astronomical numerical integration routine and is suitable for integrating the motion of satellites, comets, and planets. The equation of motion may include the effects of a model atmosphere and also the effects of an equatorial bulge that has been adjusted to represent the Earth as well as available satellite observations allow.

See also: **14118** (flight control systems); **14670** (automation of oil and gas production); **14994** (numerical control of flame cutting); **14999** (computer for rolling mill office.

ELECTRICAL ENGINEERING

14500* (English.) **The Influence of the Material Properties of Electrodes Upon the Breakdown Potential.** Gy. Vajda. *Acta Technica Academiae Scientiarum Hungaricae*, v. 21, nos. 1-2, 1958, p. 141-171.

The conditions for breakdown of insulators in various physical states are deduced from an equation expressing the lability of the elementary processes taking place in the insulator and the extent to which the elementary processes taking place upon the electrodes influence the breakdown. According to these investigations, electrostatic emission is the most effective, but in gases photoelectric emisison and secondary emission due to positive ions can also play their part.

14501* (English.) **A New Synchronizing Method for System Disturbance Conditions. (Mainly in the Case of Turbogenerators).** P. O. Geszti. *Acta Technica Academiae Scientiarum Hungaricae*, v. 21, nos. 1-2, 1958, p. 243-254.

The method shows that with unipolar precise synchronization smaller power transients arise. This is important in synchronizing under disturbance conditions, for both the system and the machine to be synchronized. The machine should be provided with an angle limiting appliance, so that in case of faulty operation, round the opposition point, currents exceeding the three-phase short circuit current should not arise. The method improves the stability conditions of the disturbed system and synchronization can be more rapidly and safely carried out under disturbance conditions.

14502* Operating Regulators With Inside-the-Delta Connection. J. E. Jacobsen and A. S. Lindway. *Allis-Chalmers Electrical Review*, v. 23, no. 2, 1958, p. 20-25.

The distinct advantages resulting from the use of three single-phase regulators connected inside-the-delta merit serious consideration by all utilities presently operating delta systems, but planning for future conversion to Y. If the utilities presently operating Y-connected systems are experiencing poor voltage regulation due to heavy loads, this condition can be greatly improved at a minimum of cost by taking advantage of the low-cost regulation and flexibility offered by well-placed single-phase regulators.

14503* (German.) The Electric Conductivity of Lead-II-Oxide With Additions of Neodymium Oxides. **Über die elektrische Leitfähigkeit von Blei-II-Oxyd mit Zusätzen von Neodymoxyd.** Horst Grunewald and Werner Neumann. *Annalen der Physik*, v. 1, nos. 4-5, May 1958, p. 198-200.

Relationship between the electric conductivity of lead-II-oxide and the Nd_2O_3 content between 200 and 500 C. This content varied between 0 and 2.0 mol %. Above 300 C the conductivity decreases with increasing Nd_2O_3 content.

14504 How to Regulate D-C Power With Transistors. R. T. Bayne and J. M. Buchanan. *Automatic Control*, v. 9, no. 1, July 1958, p. 6-9.

Method for increasing the amount of d.c. power which may be regulated by typical power transistors. Although this does not represent a radically new approach to the regulation and control of voltages, one point is clearly defined: the action of the power transistor switch and thyratron-like action of the magnetic amplifier are complimentary and can be combined to produce highly regulatory circuits.

14505 Transmission Characteristics of a Three-Conductor Coaxial Transmission Line With Transpositions. G. Raisbeck and J. M. Manley. *Bell System Technical Journal*, v. 37, no. 4, July 1958, p. 835-876.

By reducing skin-effect losses in the central conductor, this three-conductor line achieves 17% lower attenuation at a particular frequency than does a two-conductor line of the same outer diameter. The matrix method used for analysis can easily be extended to *n*-conductor lines. Suggestions for making improved three-conductor coaxial lines are made.

14506 Oxide of the 3*d* Transition Metals. F. J. Morin. *Bell System Technical Journal*, v. 37, no. 4, July 1958, p. 1047-1084.

A tentative energy band scheme for the 3*d* oxides is provided. Discussion is restricted to the simple oxides.

14507* Polyphase A.C. Motors. J. L. Watts. *Coke and Gas*, v. 20, July 1958, p. 279-283.

Possible causes of overheating in electric motors of this type and its prevention.

14508 Frequency Response of a Nonlinear Closed-Loop System. W. A. Stein and G. J. Thaler. *Electrical Engineering*, v. 77, Aug. 1958, p. 689.

Presents two general concepts which are valuable in analyzing nonlinear servomechanisms: graphical procedure and an analytical method.

14509 Mechanism for Nontracking Organic Insulators. R. S. Norman and A. A. Kessel. *Electrical Engineering*, v. 77, Aug. 1958, p. 699.

Description of a proposed internal oxidation mechanism to eliminate formation of carbonized tracks upon exposure to surface electrical arcs.

14510 Determination of Optimum Transmission Voltage. R. D. Camburn and R. L. Stafford. *Electrical Engineering*, v. 77, Aug. 1958, p. 700-703.

In this article, 345 kv. systems are compared with the more commonly used 138 kv. systems on the basis of right-of-way requirements, reliability of operation, and cost.

14511 Digital Computers for Distribution Systems. D. N. Reps. *Electrical Engineering*, v. 77, Aug. 1958, p. 708-713.

The significance of digital computers for power distribution; a list of areas offering promise for future application.

14512 The Philosophy of Engineering Reliability. II. M. L. Miller. *Electrical Engineering*, v. 77, Aug. 1958, p. 714-718.

A discussion of present definitions and concepts, and an attempt to show how reliability of parts influences system reliability. The importance of life testing is discussed briefly along with some comments on system design.

14513 Standard Basic Impulse Insulation Levels. *Electrical Engineering*, v. 77, Aug. 1958, p. 727-729.

Since the issue of a report on basic impulse insulation levels in 1941, additional information regarding system grounding practices and maximum operating voltages has been made available. This new report provides recommended values applicable to equipment for use on grounded and ungrounded a.c. supply systems.

14514* Digital Computer Calculates Transient Stability Problems. G. W. Stagg, A. F. Gabrielle, and J. F. Hohenstein. *Electrical World*, v. 150, Sept. 1, 1958, p. 49-50.

Cuts time and costs required for fault study.

14515* (Czech.) A Reversible Quick-Break Switch for High-Voltage Electric Motors. **Reversační rychlopřepojovač pro vysokonapět'voé motory.** L. Ruml. *Elektrotechnik*, v. 13, no. 6, June 1958, p. 202-203.

A simplified reversing of the high-voltage induction motors by means of a switch with pneumatic drive.

14516* The Television Backbone of Canada. *Engineering Journal*, v. 41, July 1958, p. 77-83.

Depicts some problems in locating relay towers and engineering details.

14517 Electroluminescence From the Surface Layer of $BaTiO_3$, $SrTiO_3$, and Associated Materials. George G. Harman. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 27-33.

It is shown that the light emission is the result of a high R.F. field across a thin surface barrier. The efficiency of this emission is very low, and a tentative value of 10^{-6}% was obtained. A model involving field emission from the metal electrode into the crystal surface layer is proposed to explain the observed phenomena. The characteristics of this surface layer are relatively insensitive to temperature, from at least −40 to 300 C. The ratio of permittivity to thickness, ϵ/L, was found to have a value of $< 1.4 \times 10^5$ cm^{-1} for the $BaTiO_3$ surface layer.

14518 Interpretation of Magnetoconductivity in *n*-Type Germanium and Silicon. Robert W. Keyes. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 34-35.

The phenomenological magnetoconductance coefficients of a cubic crystal, which were introduced by Seitz, are expressed in terms of the phenomenological magnetoconductance constants of a single valley for energy bands consisting of [111] and [100] valleys. It is found that the so-called "symmetry conditions" on the magnetoconductance depend on the vanishing in the principal axis directions of the longitudinal magnetoconductance coefficients of a single valley. Combinations of the magnetoconductance coefficients are also found which constitute approximate measures of the transverse magnetoconductivity and the anisotropy of a single valley.

14519 Remarks on the Meissner Effect. M. R. Schafroth. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 72-74.

It is shown that a theory of superconductivity which starts from an "effective" Hamiltonian with significantly velocity-dependent interaction between electrons does not possess well-defined magnetic properties. The Meissner effect cannot therefore be established from such a theory. This applies in particular to the Bardeen-Cooper-Schrieffer theory.

14520 Improved Electrical Differentiation of Retarding Potential Measurements. Lewis B. Leder and J. Arol Simpson. *Review of Scientific Instruments*, v. 29, July 1958, p. 571-574.

A system for obtaining differential spectra from retarding potential measurements by the superposition of a small a.c. signal on the retarding voltage has been developed. The principal improvements are the choice of the point of injection of the modulation signal, the use of a low impedance preamplifier to improve the accuracy of the energy scale, and the use of a synchronous detector to improve the stability and reduce the effect of noise.

14521 Theory of Dielectrics. Dielectric Constant and Dielectric Loss. H. Fröhlich. 2nd Ed. 192 pp. 1958. Oxford University Press, London. (QC585 F92t2)

A systematic account of the theory of dielectric properties providing a background against which applications can be made.

See also: **14265** (transitions in insulators); **15308** (the Peltier effect).

ELECTROCHEMISTRY

14522 (German.) Electrochemical Behavior of a Passive Austenitic Chromium-Nickel-Steel, of a Chromium-Molybdenum Steel, and Passive Electrolytic Chromium in Boiling 20% Sulfuric Acid. **Das elektrochemische Verhalten eines passiven austenitischen Chrom-Nickel-Stahles, eines Chrom-Molybdän-Stahles und passiven Elektrolytchroms in siedender 20prozentiger Schwefelsäure.** Carl Carius. *Archiv für das Eisenhüttenwesen*, v. 29, no. 7, July 1958, p. 449-461.

Phenomena produced on passive electrodes by the action of redox potentials. Steady current-density-potential curves of a steel with 18% Cr and 8% Ni, of a steel with 27% Cr and 2% Mo, and of electrolytic Cr, for polarization time between < 2 and about 50 hrs.

14523 A New Zinc-Iodate Primary Battery. J. L. Jones and A. B. Arranaga. *Electrochemical Society, Journal*, v. 105, Aug. 1958, p. 435-439.

This new battery comprises a Zn anode, a K iodate cathodic reactant, and an electrolyte consisting substantially of H_2SO_4. A reserve battery of this type is capable of comparatively high current drain rates, typically 0.092 amp/cm^2 (0.6 amp/in.^{2}) at a discharge potential of 1.6 v. for 7 min., with an energy output of 2.32 w. min/cm^3 and w. min/g output of 1.88.

14524 Halogen-Activated Solid Electrolyte Cell. J. L. Weininger. *Electrochemical Society, Journal*, v. 105, Aug. 1958, p. 439-441.

This new type cell consists of a small bead of Ag halide with Ta and Ag wires, cathode, and anode, respectively. The mechanism of the electrochemical reaction of this cell has been determined. When the cell is exposed to Br or I vapor, it is a promising primary cell for elevated temperatures. With silver iodide as electrolyte, the cell can be recharged several times.

14525 Protection of Molybdenum From Oxidation at Elevated Temperatures. Dwight E. Couch, Harold Shapiro, John K. Taylor, and Abner Brenner. *Electrochemical Society, Journal*, v. 105, Aug. 1958, p. 450-456.

Molybdenum may be protected against oxidation at 1100 C by composite coatings of Cr and Ni. Adhesion of Cr to Mo was obtained by anodically etching the Mo in a solution of sulfuric and phosphoric acids (1:1 by volume) before plating.

14526 Selective Electrolytic Etching of Germanium and Silicon Junction Transistor Structures. I. A. Lesk and R. E. Gonzalez. *Electrochemical Society, Journal*, v. 105, Aug. 1958, p. 469-472.

The electrolytic dissolution of Ge and Si has been applied to the selective etching of n-p-n and p-n-p junction transistor structures. By employing the electrical properties of p-n junctions internal to the pellet as well as the electrolytic behavior of the n- and p-type Ge or Si, part of the emitter or collector (or both) of a transistor pellet may be etched away, leaving the rest of the pellet intact. The resulting exposure of part of the base region may be used to locate the base region and facilitate attachment of the transistor base lead.

14527 Mechanism of Anode Thermal Reaction in Aluminum Reduction Cells. Harry Stern and G. T. Holmes. *Electrochemical Society, Journal*, v. 105, Aug. 1958, p. 478-483.

A number of Al production potlines were subjected to a series of counter e.m.f. tests wherein the decay of the reversible voltage with time was measured. Analysis of these data indicate that the reversible voltage during electrolysis is associated with an intermediate compound C*O on the anode surface which decomposes chemically to CO_2 by a reaction of approximately second order.

14528 The Effect of Gamma Irradiation on the Potential Behavior of Platinum and Stainless Steel Electrodes. Walter E. Clark. *Electrochemical Society, Journal*, v. 105, Aug. 1958, p. 483-485.

14529 The Use of Nickel-Aluminum Alloys Coatings for the Protection of Molybdenum From Oxidation. D. E. Couch, H. Shapiro, and A. Brenner. *Electrochemical Society, Journal*, v. 105, Aug. 1958, p. 485-486.

The coatings were prepared by plating the Mo with 25μ (1 mil) of Cr followed by 175μ (7 mils) of Ni. These samples were then plated with 50-75μ (2-3 mils) of Al.

14530 Spiral Bending Test for Electrodeposited Coatings. J. Edwards. *Institute of Metal Finishing, Bulletin*, v. 8, no. 2, Summer 1958, p. 101-106.

A simple method of measuring the ductility of rather brittle electrodeposited coatings is described. A plated strip is bent round a former in the shape of an equiangular (logarithmic) spiral and the radius of curvature at which the coating cracks is read off directly from graduations on the former. The % elongation at this point is simply calculated from the radius of curvature and the thickness of the plated strip.

14531 Hydrogen Overpotential on Electroplated Copper-Tin Alloys. I. A. Ammar and H. Sabry. *Journal of Physical Chemistry*, v. 62, July 1958, p. 801-805.

Hydrogen overpotential was measured on electroplated Cu, Sn, and Cu-Sn alloys, in 1.0 *N* HCl at 30 C. Six alloys ranging in composition from 12 to 80% Sn were studied.

14532 Plating and Anodizing Rack Design. Henry Kraus. *Metal Finishing*, v. 56, Aug. 1958, p. 62-69.

A detailed article giving design principles and construction consideration.

14533 Science for Electroplaters. XXXIX. Organic Acids. L. Serota. *Metal Finishing*, v. 56, Aug. 1958, p. 73 + 3 pages.

Monobasic acids, higher fatty acids, halogen-substituted acids, and hydroxy-acids.

14534 Bright Silver Plating. *Metal Industry*, v. 93, July 25, 1958, p. 73-74.

Baker Platinum Division of Engelhard Industries, Ltd. have recently introduced a bright Ag plating process. Special features include mirror-bright finish through a complete range from flash to heavy deposit. Deposits are hard (V.P.N 135) and highly ductile.

14535 Multi-Layer Plating on Titanium. *Metal Industry*, v. 93, July 25, 1958, p. 78.

A method of plating Ti and its alloys that involves briefly the deposition of four dissimilar metals, has been developed by North American Aviation, Inc.

14536* (Italian.) Study on the Electrode Behavior of Titanium. **Ricerche sul comportamento anodico del titanio. I.** Anodic Voltage Measurements. **Determinazioni di tensioni anodiche.** Bruna Rivolta. *Metallurgia Italiana*, v. 50, no. 5, May 1958, p. 173-180.

Influence of current density and temperature on Ti in 0.5 N solutions of: HCl, NaCl, H_3BO_3, NH_2HSO_3, KOH, Na_2S, NaF, and $HClO_4$.

14537* (English.) **On the Construction and the Behavior of Constituents in the Molten Slag of the Fundamental System.** Rokuro Sakagami and Yukio Matsushita. *Tokyo University, Institute of Industrial Science, Reports*, v. 7, no. 4, Mar. 1958, p. 181-224.

Results on the e.m.f. measurement of the reversible cell. The decomposition voltage and the electrical conductivity are described and some consideration is made on the construction of the molten slag and behavior of the constituents.

14538 The Chemical Displacement Plating of Zirconium and Zircaloy. F. M. Cain, Jr. *U. S. Atomic Energy Commission, WAPD-BT-6*, Jan. 1958, p. 48-57. (UF767 Un3.1wb Contin.)

A number of metals and combinations of metals were used under various conditions. Results showed that displacement plating, particularly with Ni, will be useful for a number of reactor applications.

14539* (Russian.) Determination of the Current Distribution in an Electrolyte and on the Electrodes by the Double Probe Method. **Opredelenie raspredeleniia toka v elektrolite i na elektrodakh metodom sdvoennogo zonda.** N. P. Gnusin. *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 6, June 1958, p. 1292-1298.

The method is based on the differential Ohm law. Measurement, with the aid of the double probe, may be carried out in a few min., using a high-resistance potentiometer. Further development of the method, using a valve voltmeter and a recorder, should reduce the time of measurement to a few sec.

See also: **14338** (electrochemical preparation of higher oxides of Ag); **14876** (trichlorethylene degassing for electroplating).

ELECTRONICS

14540 Experiments on cm Waves in Analogy With Acoustic Techniques Made in Göttingen. Erwin Meyer. *Acoustical Society of America, Journal*, v. 30, July 1958, p. 624-632.

In the past four years a series of experiments has been carried out which serve to demonstrate the success of analogies between acoustical systems and electromagnetic wave systems in the microwave frequency region. Measuring techniques in the two disciplines are compared, with particular emphasis on the use of reverberation chambers. Analogous directive microphones and electromagnetic devices have been constructed. The design and performance of absorbing structures of both nonresonant and resonant types are discussed at length.

14541* (German.) Measurements of Secondary Electron Emission From Selenium. **Messungen der Sekundärelektronenemission an Selen.** G. Oertel. *Annalen der Physik*, v. 1, nos. 6-8, 1958, p. 305-318.

A static and a dynmiac method is used to study the effect of temperature on the distribution of energy of the secondary emission with different additions of Br and Te. All maxima of energy distribution are near 2.3 e.v.

14542* Radiation-Tolerant Electronic Materials. Victor DeBiasi. *Aviation Age*, v. 30, no. 2, Aug. 1958, p. 72 + 7 pages.

Mechanism of occurrence of radiation damage; radioactivity characteristics of electronic materials.

14543 Diode Amplifier Has Low Noise Potential. James A. Fusca. *Aviation Week*, v. 69, Aug. 4, 1958, p. 69 + 2 pages.

New variable reactance amplifier which uses semiconductor diodes as the active elements, offers advantages of extremely low noise, simplicity, long life, and low cost.

14544 Synthesis of Series-Parallel Network Switching Functions. Warren Semon. *Bell System Technical Journal*, v. 37, no. 4, July 1958, p. 877-898.

From the switching functions of *n* variables, those which correspond to networks are abstracted and called network functions. Properties of those network functions corresponding to series-parallel networks are studied and a method for synthesis is developed.

14545 Circular Waveguide Taper of Improved Design. Hans-Georg Unger. *Bell System Technical Journal*, v. 37, no. 4, July 1958, p. 899-912.

Optimal tapers and almost optical tapers are found. An improved taper connecting ¾-in. to 2-in. I.D. waveguide must be 3-ft. long to keep the spurious mode level below −50 db for frequencies up to 75 kmc. A taper of constant cone angle would have to be 58-ft. long to obtain the same spurious model level.

14546 The Nonuniform Transmission Line as a Broadband Termination. Ira Jacobs. *Bell System Technical Journal*, v. 37, no. 4, July 1958, p. 913-924.

Attention is restricted to lines in which only the distributed shunt admittance may be varied.

14547 Shot Noise in p-n Junction Frequency Converters. A. Uhlir, Jr. *Bell System Technical Journal*, v. 37, no. 4, July 1958, p. 951-988.

General equations are derived for the noise figure. A p-n junction with a purely capacitive nonlinear admittance permits, theoretically, noiseless amplification. Structures are suggested for approximating this ideal.

14548 Gain and Noise Figure of a Variable-Capacitance Up-Converter. D. Leenov. *Bell System Technical Journal*, v. 37, no. 4, July 1958, p. 989-1008.

The performance of a p-n junction nonlinear-capacitance diode as a low-noise, amplifying frequency converter is analyzed for the case in which the output signal frequency is many times greater than the input signal frequency. Formulas for the maximum available gain and the noise figure of the circuit are obtained.

14549 Nonstationary Velocity Estimation. T. M. Burford. *Bell System Technical Journal*, v. 37, no. 4, July 1958, p. 1009-1021.

A nonstationary noise may frequently be approximated by the product of a stationary noise and a deterministic function of time. From observations of the sun of such a nonstationary noise and a linear signal, an estimate of the rate of change of the signal is found.

14550 Amplitude Modulation Suppression in FM Systems. C. L. Ruthroff. *Bell System Technical Journal*, v. 37, no. 4, July 1958, p. 1023-1046.

Inadequacies of some limiter concepts are discussed and a limiter analysis in terms of low-index modulation theory is presented.

14551* Recent Developments in Communications Measuring Instruments. E. Garthwaite and A. G. Wray. *British Institution of Radio Engineers, Journal*, v. 18, July 1958, p. 387-397.

Shows how needs are being met by improving existing design, developing and exploiting new measuring techniques, and producing test sets to fulfill certain specific functions. Gives examples.

14552* Radio Studies During the International Geophysical Year 1957-8. W. J. G. Beynon. *British Institution of Radio Engineers, Journal*, v. 18, July 1958, p. 401-416.

Ionospheric investigations discussed are vertical soundings, ionospheric drift measurements, back-scatter soundings, radio noise and atmospheric studies, and rockets and satellites.

14553* Measurement of Permeability at V.H.F. Using Transmission Line Technique. J. C. Anderson. *British Institution of Radio Engineers, Journal*, v. 18, July 1958, p. 417-424.

14554* Factors in the Design of Airborne Doppler Navigation Equipment. E. G. Walker. *British Institution of Radio Engineers, Journal*, v. 18, July 1958, p. 425-444.

Choice of radio frequencies, beam configuration, radiated power and other system parameters is discussed and some basic quantitative expressions derived.

14555 Thermionic and Related Properties of Calcium Oxide. B. J. Hopkins and F. A. Vick. *British Journal of Applied Physics*, v. 9. July 1958, p. 257-264.

Thermionic emission and conductivity CaO on Ni have been followed during activation and poisoning. The effects of material liberated from the anode have been studied.

14556 The Performance of Infra-Red Photoconductive Cells. D. H. Roberts and B. L. H. Wilson. *British Journal of Applied Physics*, v. 9, July 1958, p. 291-299.

Expressions are derived for the responsivity and signal/noise ratio of photoconductive detectors under various conditions of noise limitation. Experimental data obtained on lead selenide cells are presented, and a simple model for the flicker noise is shown to be consistent with the experimental observations.

14557 The Forward-Scattered Radio Signal From an Overdense Meteor Trail. P. A. Forsyth. *Canadian Journal of Physics*, v. 36, Aug. 1958, p. 1112-1124.

A particular trail was selected to permit the derivation of each of its parameters in several different ways.

14558* (German.) Problem of Measuring the Activation Energy in Unsteady Emission Phenomena. **Zum Problem der Messung der Aktivationsenergie bei Nichstationären Emissionserscheinungen.** Radko Seidl. *Czechoslovak Journal of Physics*, v. 8, no. 3, 1958, p. 349-354.

Proposal and trying a method for measuring the activation energy of emission processes in exoelectron emission. Using the method for determination of the activation energy of the emission current in surface oxidation of Cu.

14559 Electron Tube Evaluation for Guided Missile Applications. H. G. Chandler. *Electrical Engineering*, v. 77, Aug. 1958, p. 690-692.

Excitation of a tube resonance for prolonged periods has proved a valuable aid in evaluating tubes for guided missile applications. Electrical and optical examination before and after vibration, and changes in the noise output spectrum are the basis for this evaluation.

14560 Electron Traps and the Electroluminescence Brightness Waveform. Frederick E. Morehead, Jr. *Electrochemical Society, Journal*, v. 105, Aug. 1958 ,p. 461-468.

A model was successfully applied to measurements of the average electroluminescence brightness for sinusoidal excitation of a binderless phosphor layer as a function of temperature, frequency, and voltage.

14561 Light Modulator Records Airborne Radar Displays. Leo Levi. *Electronics* (Engineering Edition), v. 31, no. 31, Aug. 1, 1958, p. 80-83.

Light modulation using an ultrasonic cell achieves resolution and dynamic ranges previously unattainable. For applications in video recording and radar strip-mapping, resolution of the device is limited only by the optical system and photographic material. Additional data can be displayed in color.

14562 Fundamentals of Sonar. J. Warren Horton. 387 pp. 1957. United States Naval Institute, Annapolis. (VK388 H78f Over.)

For sonar engineers and naval officers who develop, design, and employ sonar equipments, the various physical factors which must be taken into account in their work are discussed in terms for their underlying nature.

14563 Batteries. C. K. Morehouse, R. Glicksman, and G. S. Lozier. *I.R.E. Proceedings*, v. 46, Aug. 1958, p. 1462-1483.

Reviews chemical compositions, structures, performance characteristics, and applications of various primary and secondary batteries. Both batteries produced presently and those in the development stages are included. Over 100 references are cited.

14564 The Resnatron as a 200-MC Power Amplifier. E. B. Tucker, H. J. Schulte, E. A. Day, and E E. Lampi. *I.R.E. Proceedings*, v. 46, Aug. 1958, p. 1483-1492.

The above demountable tubes are continuously pumped, grid pulsed 202 Mc. amplifiers capable of a peak output of 3.5 megw during 300μ sec. pulses with 2% duty cycle.

14565 Atmospheric Effects on VHF and UHF Propagation. George H. Millman. *I.R.E. Proceedings*, v. 46, Aug. 1958, p. 1492-1501.

Mathematical relationships are derived for calculating refraction effects, time delays, Doppler errors, polarization changes, and attenuation experienced by radio waves traversing the entire atmosphere.

14566 Atmospheric Noise Interference to Medium Wave Broadcasting. S. V. Chandrashekhar Aiya. *I.R.E. Proceedings*, v. 46, Aug. 1958, p. 1502-1509.

A systematic physical analysis of how the atmospheric noise impulse as heard by the ear arises and how it causes annoyance to the listener of broadcast programs.

14567 Suppression of Undesired Radiation of Directional HF Antennas and Associated Feed Lines. H. Brueckmann. *I.R.E. Proceedings*, v. 46, Aug. 1958, p. 1510-1516.

Progress made in suppressing side lobes through the advent of modified horn-type antennas.

14568 Optimum Noise Performance of Linear Amplifiers. H. A. Haus and R. B. Adler. *I.R.E. Proceedings*, v. 46, Aug. 1958, p. 1517-1533.

A single quantitative measure of amplifier spot noise performance, a function of the amplifier noise and circuit parameters above is established.

14569 Report of Advances in Microwave Theory and Techniques—1957. Robert E. Beam. *IRE Transactions on Microwave Theory and Techniques*, v. MTT-6, no. 3, July 1958, p. 251-263. (TK1 In6.6mt Vis.)

A review with 320 references.

14570 Radiation From a Rectangular Waveguide Filled With Ferrite. G. Tyras and G. Held. *IRE Transactions on Microwave Theory and Techniques*, v. MTT-6, no. 3, July 1958, p. 268-277. (TK1 In6.6mt Vis.)

The solution to the problem is found for the cases of longitudinal and transverse magnetization of the ferrite.

14571 Theoretical Analysis of the Operation of the Field-Displacement Ferrite Isolator. Kenneth J. Button. *IRE Transactions on Microwave Theory and Techniques*, v. MTT-6, no. 3, July 1958, p. 303-308. (TK1 In6.6mt Vis.)

The microwave electric field patterns within the waveguide are plotted for several values of the physical design parameters of the isolator for which experimental performance data have been reported.

14572 Ultrasonic Measurement of Polarization Switching Processes in Barium-Titanate Single Crystal. K. Husimi and K. Kataoka. *Journal of Applied Physics*, v. 29, Aug. 1958, p. 1247-1251.

A previously developed nondestructive piezoelectric method for studying the state of polarization of ferroelectric crystals is applied. Three polarization processes were proposed. The first and second processes were designated nucleation and growth by Merz. The third process cannot be measured by conventional pulse methods, and has a very slow polarizing velocity. This indicates the existence of layers which lie between the surface and inner layer. Switching time results were considred in the light of the experiments.

14573* Low-Frequency Reflection in the Ionosphere. II. Hermann Poeverlein. *Journal of Atmospheric and Terrestrial Physics*, v. 12, no. 4, July 1958, p. 236-247.

Metallic-type reflection is found at high electron concentration and dielectric-type reflection at medium electron concentration above a certain frequency limit.

14574* Investigation of Magneto-Ionic Fading in Oblique Incidence Medium-Wave Transmissions. M. Srirama Rao and B. Ramachandra Rao. *Journal of Atmospheric and Terrestrial Physics*, v. 12, no. 4, July 1958, p. 293-305 + 1 plate.

Periodic fading is interpreted theoretically by calculating the phase paths by a graphical integration method assuming Chapman and parabolic ion distribution.

14575* Observations of Angle of Arrival of Meteor Echoes in V.H.F. Forward Scatter Propagation. K. Endresen, T. Hagfors, B. Landmark, and J. Rödsrud. *Journal of Atmospheric and Terrestrial Physics*, v. 12, no. 4, July 1958, p. 329-334 + 1 plate.

The diurnal variation of the angle of arrival of the meteoric reflections is in good agreement with present theories.

14576* NEL Reliability Bibliography. W. E. Jorgensen, I. G. Carlson, and C. G. Gros. Sections individually paged. 1956. U. S. Navy Electronics Laboratory, San Diego. (ZTK7870 Un3.7n Ref.)

An annotated bibliography covering circuit design, components, electron tubes, failure analysis, general, human engineering, maintenance, mechanical design, systems, and testing. Abstracts are printed four to a page and may be cut into 3 x 5 in. cards for filing.

14577 Analysis of Diode-Detector Circuits for Signals With Asymmetrical Sidebands. V. van Weel. *Philips Research Reports*, v. 13, no. 4, Aug. 1958, p. 301-326.

A theoretical analysis in which the carrier is detuned with respect to the resonance frequency of the I.F. circuit.

14578 Induced and Spontaneous Emission in a Coherent Field. I. R. Senitzky. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 3-11.

The interaction between a coherently oscillating radiation field, such as is generally encountered in microwave experiments, and a number of similar atomic systems coupled to the field through their electric dipole moments is analyzed for the case of resonance between atomic system and field, with both the field and molecules treated quantum-mechanically.

14579 Phonon-Drag Thermomagnetic Effects in *n*-Type Germanium. I. General Survey. C. Herring, T. H. Geballe, and J. E. Kunzler. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 36-57.

14580 Measurement of Germanium Surface States by Pulsed Channel Effect. G. Rupprecht. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 75-81.

Densities, cross sections, and activation energies of several fast Ge surface states are inferred from low-temperature conductivity relaxations in a thin diffused surface layer. Relaxations are induced by application of a sudden reverse biasing pulse. The observed rate of change of channel conductance as a function of temperature is analyzed in terms of a model wherein the equilibrium surface Fermi level is presumed to remain in close proximity to a trap level. The results indicate the existence of an electron trap 0.24 e.v. from the conducton band and two hole traps 0.17 and 0.22 e.v. from the valence band.

14581 Mobility of Electrons in Germanium-Silicon Alloys. Maurice Glicksman. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 125-128.

The mobility of electrons in Ge-Si alloys with compositions varying from 0 to 30 at.% Si has been measured between 77 and 300 K and the contribution of ionized impurity scattering has been subtracted.

14582 Radiotionless Recombination in Phosphors. Leon Bess. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 129-132.

An Auger-type process is proposed for a possible means of nonradiative annihilation of free holes at electron traps in phosphors. A rough calculation is made of the cross section for the process, and some of the consequences are considered qualitatively.

14583 Large-Signal Surface Photovoltage Studies With Germanium. E. O. Johnson. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 153-166.

The studies were carried out over a considerably wider range of excess carrier densities than previously reported. Ambient induced inversion and accumulation layer surfaces were studied on *p*- and *n*-type Ge with resistivities ranging from 1 to 15 ohm-cm. The photovoltage was measured with a.c. methods and the excess carrier density was monitored by changes in the specimen conductance.

14584 Effective Mass of Electrons in Gallium Arsenide. L. C. Barcus, A. Perlmutter, and J. Callaway. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 167-168.

The effective mass of electrons in a sample of *n*-type Ga arsenide has been measured by determining the reflectivity in the infrared. The value obtained, $(0.043 \pm 0.005)m_e$, supports the hypothesis that the minimum of the conduction band is at the center of the Brillouin zone.

14585 Electrical Conduction via Slow Surface States on Semiconductors. H. Statz and G. A. deMars. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 169-182.

Steady-state and transient conductance of inversion layers created by acetone vapor on Si *n-p-n* bars were investigated. The interpretation gives strong evidence that the charge in the outer surface states can move in an electric field. The mobility of the charge is found to be of the order of 10^{-8} cm²/volt sec. for thick films, and it becomes progressively smaller in thinner films.

14586* (Ukranian.) Forced Oscillations of a System Actuated by an External Alternating Frequency Power. **Kolivannia sistemi pid vplivom zburiuiuchoi sili zminnoi chastoti.** R. I. Chertkov. *Prykladna Mekhanika*, v. 4, no. 2, 1958, p. 139-159.

When the frequency is considered to be a periodic time function the problem may be attacked by using the mathematical apparatus of generalized Bessel functions derived by M. I. Akimov.

14587 High-Speed Pulse Amplitude Discriminator. F. J. M. Farley. *Review of Scientific Instruments*, v. 29, July 1958, p. 595-596.

A circuit for pulse height discrimination in fast counting systems is described.

14588 Electronic Tracing of Oscilloscope Displays. C. H. Hertz and E. Möller. *Review of Scientific Instruments*, v. 29, July 1958, p. 611-613.

An electronic circuit is described which permits the direct recording of a repetitive H.F. signal shown on the screen of a CRO by a comomn pen recorder.

14589* Pickup Tube Performance With Slow Scanning Rates. Charles T. Shelton and H. W. Stewart. *Society of Motion Picture and Television Engineers, Journal*, v. 67, July 1958, p. 441-451.

A study of the operation of standard image orthicons and vidicons at reduced rates. Resolution, sensitivity, and other characteristics of these tubes were measured.

14590* Development of the Thin Cathode-Ray Tube. William Ross Aiken. *Society of Motion Picture and Television Engineers, Journal*, v. 67, July 1958, p. 452-455.

Designed primarily for "on-the-wall," viewing, the thin tube has excellent focusing properties and permits simultaneous viewing from both sides of the display surface.

14591* Development and Applications of Transparent Cathode-Ray Screens. Charles Feldman. *Society of Motion Picture and Television Engineers, Journal*, v. 67, July 1958, p. 455-460.

Applications of the transparent screen to the Navy's flat cathode-ray tube, daylight viewing tube, and the laminated color tube are described.

14592* Army Television Research and Development. William A. Huber and Richard B. Le Vino. *Society of Motion Picture and Television Engineers, Journal*, v. 67, July 1958, p. 465-469.

A technical survey indicating those technological limitations that now exist and are seriously impeding the military applications of television.

14593 Transistor Technology. F. J. Biondi, editor. v. II. 701 pp. 1958. D. Van Nostrand, New York. (TK7872.T73 B41t)

Silicon is considered in detail, followed by properties of specific interest in transistors and transistor-like devices and the control of lifetime in Ge and Si. The discussion of diodes emphasizes avalanche mechanism, and in the junction-triode area large-signal behavior and switching design as well as principles related to frequency response of transistors.

14594* (Russian.) Investigation of Dielectric Losses in Insulating Papers. **Issledovanie dielectricheskikh poter' v izoliatsionnykh bumagakh.** N. N. Kaliazina. *Zhurnal Tekhnicheskoĭ Fiziki*, v. 27, no. 12, Dec. 1957, p. 2718-2724.

Developing method of measuring angle of losses of untreated capacitor paper, and investigation of the connection between value of angle of losses of the paper and its composition.

14595* (Russian.) Penetration of Electrons Into Germanium and Silicon. **Proniknovenie elektronov v germanii i kremnii.** B. Ia. Iurkov. *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 6, June 1958, p. 1159-1164.

On the basis of the Spencer theory, the curves of loss of energy of electron J (x) were plotted for Ge and Si. J (x) was compared with experiemntal ionization curves G (x) for Ge.

14596* (Russian.) Silicon Photodiodes. **Kremnievye fotodiody.** S. M. Ryvkin, N. B. Strokan, V. M. Tuchkevich, and V. E. Chelnokov. *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 6, June 1958, p. 1165-1168.

Investigating the possibilities to use Si electron hole phototubes as converters of luminous signals into electric signals under photodiode conditions, that is, by means of voltage applied in the cut-off direction.

14597* (Russian.) Tellurium Oxide Photoresistances. **Fotosoprotivleniia iz okisi tellura.** R. Ia. Berlaga and S. N. Chechurin. *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 6, June 1958, p. 1174-1176.

Preparing photosensitive TeO_2 layers by sublimation in vacuum. Layers with specific resistances up to 10^9 ohm. cm. and photosensitivity up to 20% with luminance of 5 candle-meters at room temperature were obtained.

14598* (Russian.) Electrical Properties of GaAs at Low Temperatures. **Elektricheskie svoĭstva GaAs pri nizkikh temperaturakh.** O. V. Emel'ianenko and D. N. Nasledov. *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 6, June 1958, p. 1177-1187.

The Hall constant and the specific electric conductivity were practically the same in the entire interval of temperature measured, that is, 1.5 ÷ 300 K. The amplitude of the change of the resistance in the magnetic field was positive at 300 and 78 K and negative below 60 K.

14599* (Russian.) On the Theory of Kinetic Phenomena in Semiconductors With a Narrow Impurity Zone. **K teorii kineticheskikh iavleniĭ v poluprovodnikakh s uzkoĭ primesnoĭ zonoĭ.** V. M. Nitsovich. *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 6, June 1958, p. 1201-1206.

Effects of the correlation between the electrons on the kinetics of the processes in a narrow impurity zone in calculating the compensating impurity. The results were used in drawing formulas of electric conductivity of the Hall constant effect and to the thermo-e.m.f. in semiconductors in the presence of a narrow impurity zone.

14600* (Russian.) Excitation of Surface Waves by the Open End of a Plane Waveguide. **Vozbuzhdenie poverkhnostnykh voln otkrytym kontsom ploskogo volnovoda.** V. I. Talanov. *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 6, June 1958, p. 1275-1292.

Functional equations were used to solve the problem of diffraction of electromagnetic waves on the open end of a plane waveguide located above a retarding structure, assuming that the last waves are prolonged inside the guide.

14601* (Russian.) Investigation of a Moderating System With Two Spirals in a Dielectric Medium. **Issledovanie zamedliaiushcheĭ sistemy s dvumia spiraliami, pomeschennymi v dielektricheskuiu sredu.** V. P. Shestopalov. *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 6, June 1958, p. 1301-1315.

Dispersion properties of the two spirals. Effect of the geometry of the spirals wound in one and opposite directions, and of the dielectric medium. Effect of the spirals and of the dielectric on the distribution of the current of energy in a retarding system.

14602* (Russian.) On the Theory of Semiconductor Energy Transformers. **K teorii poluprovodnikovykh preobrazovateleĭ energii.** B. Ia Iurkov. *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 7, July 1958, p. 1365-1370.

On the basis of the Spenser theory of loss of energy by means of the electron, a theory of a semiconductor energy transformer of polyenergetic electrons into electric energy is developed. The formula of the current generation (short circuit current) of the transformer is convenient for practical calculations.

14603* (Russian.) Adiabatic Galvano- and Thermomagnetic Phenomena in Semicodunctors. **Adiabaticheskie gal'vano- i termomagnitnye iavleniia v poluprovodnikakh. I.** Impurity Semiconductors. **Primesnye poluprovodniki.** I. M. Tsidil'kovskiĭ. *Zhurnal Tekhnicheskoĭ Ziziki*, v. 28, no. 7, July 1958, p. 1371-1381.

Theoretical study of these phenomena in isotopic semiconductors in the case of strong magnetic fields.

14604* (Rusisan.) Investigation of the Action of Low Energy Electrons on the *p*—*n*-Junctions in Germanium. **Issledovanie deĭstviia elektronov malykh energiĭ na *p*—*n*-perekhod v germanii.** U. B. Soltamov and E. S. Grishin. *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 7, July 1958, p. 1394-1396.

The energy of the electrons investigated reached 1000 e.v. Shallow penetration of slow electrons into the Ge thickness; importance of the superficial recombination. Dependence of the phenomena found on the state of the surface.

See also: **14266** (conductivity of silicon and borate glasses); **14504** (power transistors); **14673** (communications via meteor bursts); **14766** (electronic measuring instruments); **14829** (InSb compounds); **15045** (sintering of semiconductor materials); **15228** (semiconductors).

ENGINEERING ECONOMICS

14605 A Control Earning Index. I. How to Calculate It. W. E. Vannah. *Control Engineering*, v. 5, Aug. 1958, p. 67-71.

Methods for predicting the increment of improved plant economy that new equipment will effect by reducing consumption of raw materials, lowering processing costs, and increasing product uniformity.

14606* Depreciation: What It Is, How It Works. *Heating & Air Conditioning Contractor*, v. 49, no. 11, Aug. 1958, p. 65-67.

Most tangible assets of a business constantly lose value as they wear out or become obsolete, and replacement is a constant problem. The average life, in years, of common depreciable items is given. Tax code regulation of depreciation, and the account procedure providing for replacement are discussed.

14607 Project Cost Control. E. A. Stallworthy. *Industrial Chemist*, v. 34, Aug. 1958, p. 442 + 3 pages.

The development of commitment and expenditure charts and the preparation of cost control reports at regular intervals, together with their uses and limitations.

14608* Titanium Castings—Is the Time Ripe? John H. Garret and Franklin P. Huddle. *Modern Castings*, v. 34, Aug. 1958, p. 18-21.

An analysis of the present market situation.

14609 The Dollar Value of Automated Thermoset Molding. *Modern Plastics*, v. 35, no. 12, Aug. 1958, p. 85 + 5 pages.

A close look at the true facts about automatic molding of plastics reveals the desirable economics of the process.

14610 Resource Training for Business, Industry, Government. 159 pp. 1958. Conservation Foundation, New York. (HC55 N21r)

Problems in development of national resources. Training requirements to enable sound decisions to be made concerning use and conservation of resources.

See also: **14281** (sea water desalting economics); **14289** (chemical engineering economics); **14638** (fuel gas market to 1970); **14857** (economics of electric furnaces vs. open-hearth); **15084** (costs of nuclear fuels).

FLUID MECHANICS

14611* (Russian.) Spread of Perturbations in Media With a Non-Linear Dependence of Stresses on Strains and Temperature. **O rasprostranenii vozmushcheniĭ v sredakh s nelineĭnoĭ zavisimost'iu napriazheniĭ ot deformatsiĭ i temperatury.** G. Ia. Galin. *Akademiia Nauk SSSR, Doklady*, v. 120, no. 4, June 1, 1958, p. 730-733.

Theoretical solution of the dynamic problem of the spread of perturbations in an ideal medium (gas, liquid, solid) occupying the half space. The perturbations are caused by a constant stress on the edge of the medium.

14612 Velocity Profile for Fully Developed Turbulent Flow in a Pipe. Thomas J. Hanratty and Duane L. Flint. *A.I.Ch.E. Journal*, v. 4, no. 2, June 1958, p. 132-136.

An equivalent Poiseuille's Law is derived for a homogeneous isotropic turbulent field.

14613 Mixing of Fluids Flowing Through Beds of Packed Solids. Earl A. Ebach and Robert R. White. *A.I.Ch.E. Journal*, v. 4, no. 2, June 1958, p. 161-169.

Extends the limited data and investigates more thoroughly the axial mixing of liquids flowing through fixed beds of solids. The variables which were investigated were fluid velocity, particle diameter, particle shape, and liquid viscosity.

14614 Individual Flim Coefficients of Mass Transfer in Liquid-Liquid Extraction. G. C. Smith and R. B. Beckmann. *A.I.Ch.E. Journal*, v. 4, no. 2, June 1958, p. 180-189.

A study of the individual film coefficients of mass transfer for two binary liquid-liquid systems of differing physical properties, namely methyl isobutyl carbinol-water and methylethyl ketone-water, in a 4-in. diam. extraction column operated as a spray column and with ½-in. Raschig ring packing.

14615 Viscous Flow in Multiparticle Systems: Slow Motion of Fluids Relative to Beds of Spherical Particles. John Happel. *A.I.Ch.E. Journal*, v. 4, no. 2, June 1958, p. 197-201.

A mathematical treatment developed on the basis that two concentric spheres can serve as the model for a random assemblage of spheres moving relative to a fluid.

14616 Flow of Two-Phase Carbon Dioxide Through Orifices. James C. Hesson and Ralph E. Peck. *A.I.Ch.E. Journal*, v. 4, no. 2, June 1958, p. 207-210.

Experimental flow rate data are presented for saturated liquid, saturated vapor, and two-phase liquid-vapor CO_2 through a convergent nozzle and a square-edged orifice. The data cover the range from the triple-point pressure to the critical pressure. Results are also presented for subcritical flow.

14617 Cavitation and Nuclei. Robert T. Knapp. *ASME, Transactions*, v. 80, no. 6, Aug. 1958, p. 1315-1324.

Cavitation may be caused by the presence of "weak spots" in the liquid. Studies were made on ordinary water. The results are consistent with one projected model of the nucleus.

14618* Bibliography of the Liquid-Solid Cyclone 1939 to 1957. O. F. Tangel, R. J. Brison, and D. A. Jacobs. 18 pp. 1958. Battelle Memorial Institute, Columbus. (ZTN515 T152b Ref.)

This is an enlarged revision of a previous bibliography on this subject which covered material published or presented before 1955.

14619 Some Experiments on Orifice Sprays. William E. Ranz. *Canadian Journal of Chemical Engineering*, v. 36, no. 4, Aug. 1958, p. 175-181.

Involves liquid jets spraying in liquids.

14620 On the Nonlinearities of Fluid Flow in Nonrigid Tubes. John W. Lambert. *Franklin Institute, Journal*, v. 266, no. 2, Aug. 1958, p. 83-102.

Several discrepancies between linear theory and experimental results are explained by the nonlinear theory. A graphic method of solution is also presented and applied to the problem of a large pulse wave in a semi-infinite tube.

14621 On the Performance of a Double-Diaphragm Shock Tube Using the Reflected-Shock Method and a Light-Gas Buffer. Charles J. Schexnayder, Jr. *Journal of the Aero/Space Sciences*, v. 25, Aug. 1958, p. 527-528.

A double-diaphragm shock-tube configuration is explained. Comparison of theoretical and experimental shock-wave strengths for the shock tube. Comparison of experimental attenuation of shock waves using various shock-tube drivers.

14622 On the Spectrum of Turbulence. Donat G. Wentzel. *Physics of Fluids*, v. 1, no. 3, May-June 1958, p. 213-214.

The spectrum of turbulence on Chandrasekhar's theory is derived.

14623 Kinetic Theory of Linear Shear Flow. E. P. Gross and S. Ziering. *Physics of Fluids*, v. 1, no. 3, May-June 1958, p. 215-224.

The flow of a monatomic gas between two parallel plates kept at the same temperature and moving in opposite directions is studied. The relative velocity of the plates is much smaller than the speed of sound.

14624 Structure of a Centered Rarefaction Wave in a Relaxing Gas. William W. Wood and F. R. Parker. *Physics of Fluids*, v. 1, no. 3, May-June 1958, p. 230-241.

The structure of the above in an ideal gas is studied theoretically and numerically, with neglect of the Navier-Stokes terms (viscosity, etc.) in the hydro-dynamic equations.

14625 Relaxation Time for Reactions Behind Shock Waves and Shock Wave Profiles. Russell E. Duff. *Physics of Fluids*, v. 1, no. 3, May-June 1958, p. 242-245.

An expression is developed for the relaxation time for the approach to equilibrium for the dissociation of a diatomic gas behind a shock wave.

14626* Weirs for Flow Measurement in Open Channels. IV. Limit of Free Discharge. F. V. A. Engel and W. Stansby. *Water and Water Engineering*, v. 62, July 1958, p. 291-295.

14627* (English.) **Magneto-Gasdynamic Channel Flow.** Edwin L. Resler, Jr. and William R. Sears. *Zeitschrift für Angewandte Mathematik und Physik*, v. 9b, nos. 5/6, Mar. 17, 1958, p. 509-518.

Concludes that the electromagnetic body force may affect gas flows in important practical ways by the possibility of accelerating a gas, flowing through a channel or pipe, to extreme speeds.

14628* (Russian.) On the Disintegration of a Liquid Jet Into Drops. **K voprosu o raspade zhidkoĭ strui na kapli.** P. I. Kuznetsov and L. Ia. Tslaf. *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 6, June 1958, p. 1220-1223.

Determining three zones produced during disintegration. Importance of the average dimensionless diameter of drops obtainable by atomization as function of no less than two parameters.

14629* (Russian.) Investigation of the Process of Condensation of Moving Pure Steam on Tube Beams. **Issledovanie protsessa kondensatsii dvizhushchegosia chsitogo para na trubnykh puchkakh.** V. A. Rachko. *Zhurnal Teknicheskoi Fiziki*, v. 28, no. 6, June 1958, p. 1237-1250.

Equation of the mass exchange and of the thermal exchange during condensation of flowing vapor-gas mixtures and of vapor on tube beams. Comparison of the intensity of heat exchange on different beams.

See also: **14102** (flow in ducts); **14270** (heat transfer to water in turbulent flow); **14696** (thermal convection in a rotating liquid); **15306** (design of high velocity air ducts).

FOOD TECHNOLOGY

14630* Fatty Acid Supplements to the Cholesterol-Fed Rabbit. Effect on Serum Lipids and Atherosclerosis. Walter M. Bortz, Nils Paul Larsen, and W. Harold Civin. *AMA Archives of Pathology*, v. 66, Aug. 1958, p. 218-224.

Those that received the unsaturated-fatty acid supplements developed distinctly less atherosclerosis than those fed cholesterol alone or cholesterol plus a saturated fatty acid. No alteration in serum lipid phosphorus or total serum lipids is apparent.

14631* Bibliography of Food. A Select International Bibliography of Nutrition, Food and Beverage Technology and Distribution 1936-56. E. Alan Baker and D. J. Foskett. 331 pp. 1958. Academic Press, New York. (Z5775 B17b Ref.)

World food supplies; distribution, marketing & retailing; prices and statistics; food control & rationing; nutrition; brewing.

14632 Ion-Exchange Chromatography of Amino Acids in Tomato Juice. George Saravacos, B. S. Luh, and Sherman J. Leonard. *Food Research*, v. 23, no. 4, July-Aug. 1958, p. 329-337.

The following free amino acids were present in canned tomato juice: alanine, asparagine, aspartic acid, glutamic acid, glutamine, glynine, leucine, serine, threonine, and valine. Acid hydrolysis of the tomato juice revealed the presence of two additional amino acids, arginine and phenylalanine.

14633* Food Preservation by Radiation as of 1958. A Report to Management. Kevin G. Shea. *Food Technology*, v. 12, Aug. 1958, p. 6 + 7 pages.

14634* The Effects of Dehydration on Actomyosin in Fish and Beef Muscle. Sheila M. V. Hunt and N. A. Matheson. *Food Technology*, v. 12, Aug. 1958, p. 410-416.

Results are interpreted as a stepwise denaturation of actomyosin.

14635* High Viscosity of Cell Wall Suspensions Prepared From Tomato Juice. R. T. Whittenberger and G. C. Nutting. *Food Technology*, v. 12, Aug. 1958, p. 420-424.

Viscosity of tomato juice is kept at a relatively low level by the presence of naturally-occurring and added electrolytes. Removal of electrolytes, including soluble pectins, organic acids, and mineral salts, may cause the remaining fraction of juice to thicken to a semigel. Electrolyte content thus is established as a newly discovered factor in determining tomato juice viscosity.

14636 Antioxidant Toxicity. Toxicological Studies on Sesamol. Anthony M. Ambrose, Alvin J. Cox, Jr., and Floyd DeEds. *Journal of Agricultural and Food Chemistry*, v. 6, Aug. 1958, p. 600-604.

Sesamol, a constituent of sesame oil, possesses antioxidant properties. It is nonirritant to the skin and does not cause skin sensitization. Long-term feeding of twice recrystallized sesamol to rats had no effects on growth, mortality, or blood morphology. Deposits of pigment occurred in the kidneys of the female rats but were unrelated to the dietary levels of sesamol. A total of 20 proliferative lesions occurred in 134 rats fed sesamol. Sixteen of the lesions were benign, two were malignant, and two were questionable. No such lesions were found in the controls, nor in rats receiving the two lowest dosages of sesamol.

14637* Chemical Aspects of Flavour Research on Milk and Its Products. Stuart Patton. *Perfumery and Essential Oil Record*, v. 49, July 1958, p. 386-390.

See also: **14183** (cholesterol).

FUELS AND COMBUSTION

14638* Distribution Growth to Pace Gas Industry. Dean Hale. *American Gas Journal*, v. 185, Aug. 1958, p. 20-21.

An economic analysis to 1970.

14639* Choosing a Peaking Gas Process. Robert Kyle and P. W. Havenstein. *American Gas Journal*, v. 185, Sept. 1958, p. 21-26.

A peak equipment study for one operating utility needing a peak generating capacity of 10,000 Mcf per day natural gas equivalent (at 1000 B.T.U. per cu.ft.).

14640 Effect of Temperature Variation on Composition, Fouling Tendency, and Corrosiveness of Combustion Gas From a Pulverized-Fuel-Fired Steam Generator. John D. Piper and Hazen Van Vliet. *ASME, Transactions*, v. 80, no. 6, Aug. 1958, p. 1251-1263.

Metal condensers, cooled to selected temperatures between 87 and 242 F, were placed in stack gas of a pulverized-fuel-fired steam generator. The amount and nature of substances depositing upon the condensers were determined. Chlorides were found to deposit at unsuspectedly high temperatures and concentrations. Corrosion rates increased markedly as the water dew point was reached.

14641* Modern Developments in Steelworks Gas Producer Practice. J. C. Martin. *Birmingham Metallurgical Society, Journal*, v. 38, no. 2, June 1958, p. 76-81.

Developmental trends are toward automatic operation with the object of providing gas of consistently good quality, and at a rate which is automatically and proportionately variable with the requirements of the furnace.

14642 Sheffield Conference on Science in the Use of Coal. M. Griffith. *British Coal Utilisation Research Association, Monthly Bulletin*, v. 22, June 1958, p. 241-252.

14643 Low-Temperature Fluidized Carbonization in Relation to Energy Production. C. Moreland. *Canadian Mining and Metallurgical Bulletin*, v. 51, no. 555, July 1958, p. 415-419; *Canadian Institute of Mining and Metallurgy, Transactions*, v. 61, 1958, p. 225-229.

Fluidized low-temperature carbonization of coal offers a possibility for reducing fuel costs of coal-burning electric generating plants.

14644 Hydrogenator Converts Heavy Oil to Fuel Gas. *Chemical Engineering*, v. 65, Aug. 25, 1958, p. 64 + 2 pages.

14645 High Energy Hydrocarbon Fuels. John Happel and Charles J. Marsel. *Chemical Engineering Progress*, v. 54, June 1958, p. 60-64.

Certain hydrocarbons of the acetylene and cyclopropane families by virtue of their extra energy, yield fuels which have higher specific impulses and increased reactivity.

14646 Nitromethane. Physical Properties, Thermodynamics, Kinetics of Decomposition, and Utilization as Fuel. A. Makovky and L. Lenji. *Chemical Reviews*, v. 58, no. 4, Aug. 1958, p. 627-644.

Review is concerned with certain aspects of the physical chemistry of nitromethane and its physical properties. The data discussed are of special interest for the use of nitromethane as fuel for rockets.

14647* Recording Differential Balances for Thermogravimetric Analysis. II. P. L. Waters. *Coke and Gas*, v. 20, July 1958, p. 289-291.

(To be continued.)

14648* The Effect of Pitch Additions on the Fluidity of Coal. J. N. Stephens. *Coke and Gas*, v. 20, July 1958, p. 296 + 2 pages.

Effect on the fluidities of coals as measured by the Gieseler plastometer.

14649* (Japanese.) **Combustion of Low Grade Fuel Oils in Gas Turbines.** Heihachiro Iida. *Fuel Society of Japan, Journal*, v. 37, no. 373, May 1958, p. 294-312.

Reviews deposition of ashes, corrosion and its control, when low grade fuel oils are used.

14650 The Glass Effect in Distillate Fuel Stability. J. G. Christian, A. J. Chiantella, J. E. Johnson, and H. W. Carhart. *Industrial and Engineering Chemistry*, v. 50, Aug. 1958, p. 1153-1156.

Soft glass has an inhibitory effect on the degradation of many fuels, but borosilicate glass is essentially inert. Storing fuels in soft glass bottles during accelerated storage tests may give misleading results.

14651* Improvement of Domestic Stove Efficiencies by Flue Dampers. L. L. Fox and D. Whittaker. *Institute of Fuel, Journal*, v. 31, no. 210, July 1958, p. 297-303 + 1 plate.

The loss of efficiency caused by leaky firedoors when these are closed can be wholly restored by a flue damper.

14652* The Mechanism of Combustion of Pulverized Fuel. P. O. Rosin. *Institute of Fuel, Journal*, v. 31, no. 211, Aug. 1958, p. 346-355.

14653* Practical Combustion Considerations in the Design of Packaged Economic-Type Boilers. C. E. Woodley. *Institute of Fuel, Journal*, v. 31, no. 211, Aug. 1958, p. 356-361.

An account of experience in Australia with the construction of oil-fired economic boilers of the "packaged" type.

14654* Measurement of Flame Speeds by a Nozzle Burner Method. Carl Halpern. *Journal of Research, National Bureau of Standards*, v. 60, no. 6, June 1958, p. 535-546.

One phase of a program of research on combustion is a study of some of the reasons for the differences among recorded values of flame speed measured by the burner method.

14655* Nuclear Irradiation of Coal for Use With Diesel Fuel. Ray McBrian. *Mining Congress Journal*, v. 44, Aug. 1958, p. 82-84.

14656* (German.) Firing of Small Forge Furnaces With Heavy Fuel Oil. Hugo Remus. **Erfahrungen bei der Beheizung von Kleinschmiedeöfen mit schwerem Heizöl.** *Stahl und Eisen*, v. 78, no. 15, July 24, 1958, p. 1038-1041.

Reasons for the change-over to fuel oil. Operational experiences with different types of burners for small furnaces.

See also: **14269** (Proceedings American Gas Assn.); **14744** (coal bibliography).

GEOLOGY, GEOPHYSICS, MINERALOGY, AND MINING ENGINEERING

14657 Fluctuation of Sound Pulses Transmitted Vertically in the Sea. J. N. Nanda and V. N. Rao. *Acoustical Society of America, Journal*, v. 30, July 1958, p. 639-641.

The advantages of studying fluctuations of underwater sound in vertical transmission and drawbacks of horizontal transmission is studied.

14658* (English.) **Calculation of the Temperature Rise of Mine Air Flow With Regard to the Effect of Its Water Vapour Content.** T. Boldizsár. *Acta Technica Academiae Scientiarum Hungaricae*, v. 21, nos. 1-2, 1958, p. 113-121.

14659* (Russian.) On the Akchagyl and Apsheronian Deposits in the Lower Reaches of the Amu-Darya River. **Ob akchagyl'skikh i apsheronskikh otlozheniiakh v nizov'iakh r. Amu-Dar'i.** M. N. Gramm. *Akademiia Nauk SSSR, Doklady*, v. 120, no. 4, June 1, 1958, p. 859-862.

A study of the distribution of the Akchagyl and Apsheronian strata downstream in the Amur-Darya. Penetration of the gulf formed by the Akchagyl Sea. Connection with the Caspian Sea.

14660* (Russian.) Certain Geographical Laws of Heat- and Water-Exchange on Dry Land and the Means of Further Study of Mass and Energy Exchange in a Geographical Environment. **O nekotorykh geograficheskikh zakonomernostiakh teploobmena i vodoobmena na poverkhnosti sushi i o putiakh dal'neĭshego izucheniia obmena veshchestv i energii v geograficheskoĭ srede.** A. A. Grigor'ev. *Akademiia Nauk SSSR, Izvestiia, Seriia Geograficheskaia*, 1958, no. 3, May-June 1958, p. 17-21.

Using the general formula $R=LE+P+B$, the relation between the ratio of heat consumption and evaporation and the turbulent heat exchange with the productivity of vegetation give the comparative material for study of these ratios.

14661 Santafeite, a New Hydrated Vanadate From New Mexico. Ming-Shan Sun and Robert H. Weber. *American Mineralogist*, v. 43, nos. 7-8, July-Aug. 1958, p. 677-687.

This new mineral was found in the Grants U district, McKinley County, New Mexico, in the spring of 1951. It has the formula $Na_2O \cdot 3MnO_2 \cdot 6(Mn, Ca, Sr)\text{-}O \cdot 3(V, As)_2O_5 \cdot 8H_2O$.

14662 Goreeixite From Dale County, Alabama. Charles Milton, J. M. Axelrod, M. K. Carron, and F. Stearns MacNeil. *American Mineralogist*, v. 43, nos. 7-8, July-Aug. 1958, p. 688-694.

Two specimens of hydrous alkali-earth rare-earth aluminum phosphate from Eocene marl in southeastern Alabama have compositions approximating $RAl_3(PO_4)_2(F,OH)_6(H_2O)_6$ and $R_{0.8}Al_{4.6}(PO_4)_2(F,OH)_{10}(H_2O)_{0.3}$.

14663 Sherwoodite, a Mixed Vanadium(IV) - Vanadium (V) Mineral From the Colorado Plateau. Mary E. Thompson, Carl H. Roach, and Robert Meyrowitz. *American Mineralogist*, v. 43, nos. 7-8, July-Aug. 1958, p. 749-755.

This new mineral with the probable formula $Ca_3V_8O_{22} \cdot 15H_2O$, has been found in small amounts in many V-U mines on the Colorado plateau.

14664* Thermal Structures in the Lowest Layers of the Atmosphere. R. J. Taylor. *Australian Journal of Physics*, v. 2, no. 2, June 1958, p. 168-176.

An analysis of a number of records of simultaneous fluctuations of temperature at four heights shows that the correlation between temperatures at two heights is greatest when the records are displaced relatively to each other. The correlation increases with height.

14665* The Wilson Effect in Sunspots. R. E. Loughhead and R. J. Bray. *Australian Journal of Physics*, v. 2, no. 2, June 1958, p. 177-184 + 1 plate.

As a spot approaches the limb, the width of the penumbra in the inner side decreases at a greater rate than that on the side of the spot nearer the limb which is termed the Wilson effect. New observations of this effect in a small regular sunspot have demonstrated the reality of the phenomena.

14666* The Flare-Surge Event. R. G. Giovanelli and Marie K. McCabe. *Australian Journal of Physics*, v. 2, no. 2, June 1958, p. 191-200 + 5 plates.

Studies of flare-surges recorded on low magnification H α flare patrol films show that dark surges on the disk come directly from flares, the initial direction of motion being almost invariably away from the nearest large sunspot. Dark surges, bright streamers on the disk, and ejected flares seem closely related. Shows that dark surges can develop only if the temperature is decreasing, while in ejected flares whose brightness increases during flight the temperature must be increasing.

14667* Polarization Measurements of the Three Spectral Types of Solar Radio Burst. M. Komesaroff. *Australian Journal of Physics*, v. 2, no. 2, June 1958, p. 201-214 + 2 plates.

A swept-frequency technique was used to measure the polarization of solar radio bursts occurring at the beginning of the present sunspot cycle. Of special interest were the results for bursts of spectral type III which were found to be highly polarized.

14668* Evidence of Echoes in the Solar Corona From a New Type of Radio Burst. J. A. Roberts. *Australian Journal of Physics*, v. 2, no. 2, June 1958, p. 215-234 + 3 plates.

A new spectral type of solar radio burst is described which contains two elements. Occasionally they occur within, and evidently form part of the structure of a burst of spectral type III.

14669* On the Cylindrical Probe Method of Measuring Thermal Conductivity With Special Reference to Soils. I. Extension of Theory and Discussion of Probe Characteristics. D. A. De Vries and A. J. Peck. *Australian Journal of Physics*, v. 2, no. 2, June 1958, p. 255-271.

Extended to the case of a probe of finite conductivity containing a line source as its center to provide a more realistic approximation to most actual probes than the theory for a probe of infinite conductivity.

14670* Automatic Techniques of Oil and Gas Production. Newton E. Armstrong. *Automation*, v. 5, Aug. 1958, p. 57-61.

Highlights equipment and techniques of the automation of oil and gas production.

14671 Army Explorer IV Satellite Reports Corpuscular Radiation Intensity. Evert Clark. *Aviation Week*, v. 69, Aug. 4, 1958, p. 30-31.

Explorer IV is equipped with high range, and lead-shielded Geiger counters and two scintillation counters.

14672 The Deformation of the Earth's Crust, an Inductive Approach to the Problems of Diastrophism. Walter H. Bucher. 518 pp. 1957. Hafner, New York. (QE511 B85d)

Subject is approached as a series of "laws" which the author describes as "good to him only as long as nothing in sight seems better".

14673 Meteor Bursts Provide Communications Path. B. M. Sifford and W. R. Vincent. *Electronics* (Engineering Edition), v. 31, no. 35, Aug. 29, 1958, p. 42-45.

Meteor bursts reflect transmitted signals and convey intelligence in V.H.F. band for transmitter-receiver distances up to 1500 miles.

14674* Land Surface Subsidence and Its Effect on Pipeline Systems. William Johnson. *Gas Age*, v. 122, July 24, 1958, p. 31-42.

Provides background on cause and effects of subsidence based on experience and steps taken to combat the effects in one instance.

14675* A Model Relating Dynamics and Sediment Pattern in Equilibrium in the Region of Shoaling Waves, Breaker Zone, and Foreshore. Robert L. Miller and John M. Zeigler. *Journal of Geology*, v. 66, no. 4, July 1958, p. 417-441 + 1 plate.

Model is based on theoretical considerations and published experimental results and is intended to hold for the above-mentioned dynamic zones in a state of equilibrium.

14676* Drilling and Blasting Long Rounds in Tunnels. II. J. S. Barker. *Mine & Quarry Engineering*, v. 24, Aug. 1958, p. 350-354.

Results obtained from experimental work on drilling and blasting long rounds.

14677 Air-Operated Clamshell for Sinking Small Shafts. James W. Lower. *Mining Engineering*, v. 10, July 1958, p. 773-775.

14678 Significance of Geochemical Distribution Trends in Soil. D. H. Yardley. *Mining Engineering*, v. 10, July 1958, p. 781-786.

Heavy metal distribution data for soil fractions of till and for active stream sediments show that the soil size fraction containing the highest proportion of heavy metals may differ in materials of different geologic history .

14679 U. S. Bureau of Mines Investigations and Research on Bumps. Edward Thomas. *Mining Engineering*, v. 10, Aug. 1958, p. 878-879.

14680 Ground Stress Investigations in Canadian Coal Mines. A. Brown. *Mining Engineering*, v. 10, Aug. 1958, p. 879-887.

14681 Control of Mountain Bumps in the Pocahontas No. 4 Seam. Woods G. Talman and John L. Schroder, Jr. *Mining Engineering*, v. 10, Aug. 1958, p. 888-891.

14682* Water Makes Mining Tough and Sloppy at Deep Ambrosia Lake U_3O_8 Mines. George O. Argall, Jr. *Mining World*, v. 20, no. 9, Aug. 1958, p. 30 + 4 pages.

14683 Natural Aerodynamics. R. S. Scorer. 313 pp. 1958. Pergamon Press, New York. (QC161 Sc72n)

Objective is to explain the relationship between the forces and the motion of any fluid with special reference to the behavior of the air we live in.

14684* (German.) Common Technical Problems Affecting Ore and Potash Mining. **Gemeinsame technische Probleme des Erz- und Kalibergbaues.** Georg Spackeler. *Neue Hütte*, v. 3, no. 6, June 1958, p. 323-330.

14685 Four-String Quadruple Completion. W. W. Poimboeuf and Robert Henderson. *Oil and Gas Journal*, v. 56, no. 32, Aug. 11, 1958, p. 98-100.

The use of four strings of 2⅜-in. extreme line tubing was first considered shortly after several triple-string completions had been installed successfully and economically for the CATC group.

14686 Long Casing Strings are Routine. Ed McGhee. *Oil and Gas Journal*, v. 56, no. 32, Aug. 11, 1958, p. 106 + 3 pages.

Two wells of 22,919 ft. and 23,000 ft. depth in Pecos Co., Texas are explained.

14687 New Giant Gas Field Is in the Making. *Oil and Gas Journal*, v. 56, no. 33, Aug. 18, 1958, p. 106-108.

Terrell County's Brown-Bassett area could balloon into West Texas' biggest and most prolific gas field.

14688 Northeastern British Columbia—Giant of the Future. G. L. Gray. *Oil and Gas Journal*, v. 56, no. 33, Aug. 18, 1958, p. 128-135.

The first published study of the regional geology of NE British Columbia. (To be continued.)

14689 Photogeology. Paul Fuenning and Andy J. Broscoe. *Oil and Gas Journal*, v. 56, no. 33, Aug. 18, 1958, p. 179 + 6 pages.

Photogeology has altered the approach to surface evaluation for many companies operating in Western Canada.

14690* Petroleum Prospecting by Microbiology. Anna Luchter. *Petroleum*, v. 21, Aug. 1958, p. 282 + 4 pages.

By growing various bacterial cultures in an environment free from all hydrocarbons except such as may be derived from an underlying deposit of crude the existence of such a deposit can be inferred.

14691 Newest Well Stimulation Technique. Henry H. Mohaupt and Herbert A. Metzger. *Petroleum Engineer*, v. 30, Aug. 1958, p. B30-B34.

Controlled ignition of a wire line explosive charge creates H.F. vibrations which cause rock failure in a horizontal plane.

14692 The Plunger Lift Method of Oil Production. III. How to Use Nomographs to Estimate Performance. Carrol M. Beeson, Donald G. Knox, and John H. Stoddard. *Petroleum Engineer*, v. 30, Aug. 1958, p. B58 + 3 pages.

Free piston performance may be predicted where depth, static bottom-hole pressure, productivity index and anticipated minimum tubing pressure are known. (To be continued.)

14693 Physics and Chemistry of the Earth. L. H. Ahrens, Frank Press, Kalervo Rankama, and S. K. Runcorn, editors. v. II. 259 pp. 1957. Pergamon Press, New York. (QE501 P56 Vis.)

Includes discussion of oceanography, geochemistry, and origin of the solar system.

14694* Gas Storage Well Deliverability Boosted by Fracturing. A. B. Waters and H. J. Ayres. *Pipe Line Industry*, v. 9, Aug. 1958, p. 32-37.

Optimum injection and delivery rates can be achieved at a fraction of the cost of a new well.

14695 Principles of Geochemistry. Brian Mason. 2nd Ed. 310 pp. 1958. John Wiley & Sons, Inc., New York. (QE515 M38p2)

14696* An Experimental Study of Thermal Convection in a Rotating Liquid. R. Hide. *Royal Society of London, Philosophical Transactions*, v. 250, Ser. A. Mathematical and Physical Sciences, no. 983, July 31, 1958, p. 441-478.

An investigation of the hydrodynamic flow that ensues when a liquid which rotates uniformly about a vertical axis is subject to a horizontal temperature gradient. Investigations of this type are of some geophysical interest in the study of the general atmospheric circulation and on hydrodynamic flow which is supposed to occur in the earth's liquid core, where the geomagnetic field originates.

14697 Hot Spots in the Atmosphere of the Sun. Harold Zirin. *Scientific American*, v. 199, no. 2, Aug. 1958, p. 34-41.

Describes regions in the sun's corona which appears to be as much as 1,000 times hotter than its surface. They may be the long-sought connection between sunspots and disturbances in the atmosphere of the earth.

14698 The National Observatory at Kitt Peak. Aden B. Meinel. *Sky and Telescope*, v. 17, no. 10, Aug. 1958, p. 493-499.

Construction is about to begin for a new observatory that will rank among the world's foremost, on Kitt Peak in southern Arizona.

14699 Rocket Ultraviolet Solar Spectroscopy. William A. Rense. *Sky and Telescope*, v. 17, no. 10, Aug. 1958, p. 502-507.

14700* *Soviet Bloc International Geophysical Year Information*, Aug. 22, 1958, 22 pp.

14701* The Photographic Observation of Artificial Satellites. M. J. Hendrie. *Spaceflight*, v. 1, no. 8, July 1958, p. 267-274.

Projects and techniques which are not too ambitious for the amateur.

14702 The Distribution of Fallout Activity in Rainfall at Brookhaven National Laboratory June to September 1957. F. P. Cowan and J. Steimers. *U. S. Atomic Energy Commission, BNL-496* (T-117), Mar. 1958, 8 pp. (UF767 Un3.1bn Contin.)

The ultimate objective of these measurements is to gain information about the atmospheric transport of bomb debris or, to put it another way, to study the atmospheric circulation by using weapons tests as gigantic tracer experiments.

14703 Upper Cretaceous of the Pacific Coast. F. M. Anderson. 378 pp. 1958. Geological Society of America, New York. (QE1 G29m Vis.)

Five hundred and four species of invertebrates are recorded. Ten new genera and subgenera are proposed.

14704* More Orderly Procedures Mark Offshore Drilling. James W. Calvert. *World Petroleum*, v. 29, Aug. 1958, p. 36-42.

With no revolutionary development in equipment, drilling costs have been cut up to 35% by increasing weight on bits and drill-collar diameters, adding stabilizers, and decreasing mud weights.

14705* Progress in the Development of Sucker Rods for Oil-Well Pumping. I. Lester C. Uren. *World Petroleum*, v. 29, Aug. 1958, p. 46-48.

14706* Offshore Seismic Exploration in the Caribbean Area. Henry L. Grant. *World Petroleum*, v. 29, Aug. 1958, p. 56-57.

An area of 75,000 sq. miles of continental shelf offshore from Caribbean sedimentary basins offers a promising region for exploration.

14707* Instrumentation for the Driller. J. W. Knowlton. *World Petroleum*, v. 29, Aug. 1958, p. 66 + 1 page.

The "feel" of the brake as a guide to down-hole conditions now is supplemented by accurate instrument reports to the driller.

See also: **15220** (magnetometer to explore earth's field).

GRAPHIC ARTS

14708* Printing in the Soviet Union. Andrei Molchanov. *American Printer & Lithographer*, v. 139, Aug. 1958, p. 20-23.

This report, direct from the Soviet Union, contains material which even a modest evaluation must consider "alarming". Whether they are technologically superior to us is unimportant—it is their rate of progress which is, frankly, disturbing.

14709* Printing in the United States; Technologically, Are the Russians Ahead of Us? Peter B. B. Andrews. *American Printer & Lithographer*, v. 139, Aug. 1958, p. 24-26.

The USSR outstrips us in book production and the tie in of books to education makes the Soviet race for knowledge an alarming contest.

14710 The Lithographers Manual. Victor Strauss, editor. v. I-II. 20th Anniversary Ed. Sections individually paged. 1958. Waltwin Publishing Co., New York. (NE2420 St82L Over.)

14711* Photography Is a Working Tool. Darrell Ward. *Machine and Tool Blue Book*, v. 53, Aug. 1958, p. 83-89.

A series of pertinent questions and answers. Some of the more unusual applications of current interest in metalworking are discussed.

14712* Ink: What It Is. Frederick J. Dankert. *National Lithographer*, v. 65, Aug. 1958, p. 12 + 2 pages.

Describes the physical properties of ink vehicles.

14713* Electronics and Process Engraving. D. J. Kyte. *Photoengravers Bulletin*, v. 47, no. 12, July 1958, p. 17-21.

Electronics' role in engraving machine and color scanner progress.

14714 The Photomechanical Halftone. Louis Walton Sipley. 62 pp. 1958. American Museum of Photography, Philadelphia. (TR975 Si75p)

A condensed treatise of one of the most commercially important phases of the *photo-graphic-arts* has been prepared with the hope that it may play some part in removing it from the category of "least understood" by professional photographers and public alike.

14715* (German.) Camera Automation—Significant Coupling of Parts. **Kamera Automatik. Sinnvolle Kopplung von Bauteilen.** *Photo-Technik und-Wirtschaft*, v. 9, July 1958, p. 276-279.

Development of two different parts used in camera design have led to a coupling of functions; one was the light-value shutter and the other the built-in exposure meter.

14716* Evaluating Standardization Progress. Frank Stolz. *Productionwise*, v. 12, no. 1, July 1958, p. 11 + 3 pages.

Reviews progress in printing standardization in the newspaper field, but points out problems that still require study.

14717* Paper Tests and Testing Methods. Charles V. Morris. *Productionwise*, v. 12, no. 1, July 1958, p. 60 + 3 pages.

Apparatus and methods employed in testing various characteristics and determining the quality of papers. Thirteen tests are listed.

14718* Illumination for Viewing Color. Warren L. Rhodes. *Productionwise*, v. 12, no. 2, Aug. 1958, p. 28-31.

New standards which leave no excuse for variances, inasmuch as everyone can see press sheets and originals under the same illumination conditions.

14719* Causes and Prevention of Static Markings on Motion-Picture Film. W. I. Kisner. *Society of Motion Picture and Television Engineers, Journal*, v. 67, Aug. 1958, p. 513-517.

Streaks, blotches, or other types of markings seen on processed film can often be traced to discharge of static electricity although the patterns produced are not always easily recognized as being due to this cause. Examples are shown and procedures suggested for minimizing occurrence of these markings.

14720* An Analytical Evaluation of the Lenticular-Plate Cinemicrograph and the Image-Dissection Process. Charles M. Huggins. *Society of Motion Picture and Television Engineers, Journal*, v. 67, Aug. 1958, p. 523-526.

Generalized equations for the time resolution of image-dissection cameras are presented and these equations are numerically solved for two important standards of performance.

14721* Design Improvements in High-Wattage Tungsten Filament Lamps for Motion-Picture and Television Studios. Leroy G. Leighton and Alfred Makulec. *Society of Motion Picture and Television Engineers, Journal*, v. 67, Aug. 1958, p. 530-533.

Development of a special-type collector grid for use in high-wattage incandescent lamps. Causes and effects of lamp blackening are explained.

See also: **14689** (photogeology).

HEAT POWER

14722 Aircraft and Missile Propulsion. v. I. Thermodynamics of Fluid Flow and Application to Propulsion Engines. M. J. Zucrow. 538 pp. 1958. John Wiley & Sons, New York. (TL709 Z83a)

Data to provide an understanding of fundamental principles governing the functioning and operating characteristics of engines for propelling winged aircraft and missiles, guided and unguided, at high speeds.

14723 Operating Experience With High-Temperature Steam-Turbine Rotors and Design Improvements in Rotor-Blade Fastening. Joseph D. Conrad and N. L. Mochel. *ASME, Transactions*, v. 80, no. 6, Aug. 1958, p. 1210-1224.

14724 A Simple Method of Estimating the Reynolds Number Effects on Aircraft Gas-Turbine Engines Operating at High Altitudes. Robert W. Pinnes. *ASME, Transactions*, v. 80, no. 6, Aug. 1958, p. 1264-1272.

Determination of correction factors for predicting high-altitude performnace from sea-level data.

14725 J79 Uses Built-Up Parts to Save Weight. J. S. Butz, Jr. *Aviation Week*, v. 69, Aug. 11, 1958, p. 69 + 4 pages.

A new design for the G. E. J79 turbojet.

14726* Gas Turbine Progress. R. Tom Sawyer. *Diesel and Gas Turbine Progress*, v. 24, Aug. 1958, p. 50-51.

A commentary on automotive gas turbine units.

14727* (Japanese.) **Gas Turbine Installation for Blast of the Blast Furnace in the Yawata Iron and Steel Works.** Tokutaro Aoki. *Fuel Society of Japan, Journal*, v. 37, no. 373, May 1958, p. 313-318.

Explains in detail the design items, the outline of operation, structures of main parts containing the blast furnace blower, an air compressor, a high pressure gas turbine, and the process of its manufacture.

14728 Jet Propulsion. Walter J. Hesse. 567 pp. 1958. Pitman Publishing Corp., New York. (TL709 H46j)

Presents a well-balanced treatment of the subject of jet propulsion with emphasis on the "principles of operation". Objective is to explain and develop all jet propulsion concepts from the fundamental engineering laws rather than from an equation standpoint.

14729 Lightweight Vehicle and Industrial Diesel Engine. *Machinery Lloyd (Overseas Ed.)*, v. 30, no. 14, July 5, 1958, p. 82-83.

Description of new 1·6 liter four-cylinder, high-speed diesel engine.

14730* Cycle Arrangements Applied to Automotive Turbines. II. The Free Compressor Differential Gas Turbine. *Oil Engine and Gas Turbine*, v. 26, July 1958, p. 123-124.

14731* 200 MW Turbo-Generators. Cross-Compound Design for Power Station in Toronto. *Overseas Engineer*, v. 32, Aug. 1958, p. 16-17.

One line consists of a high-pressure turbine and a double-flow intermediate turbine driving a 100 MW generator at 3,600 r.p.m., and the other, a second intermediate turbine and a double-flow low-pressure turbine driving at 100 MW generator at 1,800 r.p.m.

14732* (Czech.) Establishing of the Economical Dimensions of Recuperators. **Stanovení ekonomické velikosti rekuperátoru.** J. Kozina. *Paliva*, v. 38, no. 6, June 1958, p. 188-192.

Theoretical method of determining optimum parameters of a recuperator based on calculation of final economy.

14733* Packaged Boilers. R. C. Bellas. *Power*, v. 102, Aug. 1958, p. 77-100.

The American Boiler and Affiliated Industries lexicon defines a packaged steam generator as "a boiler equipped and shipped complete with a fuel-burning equipment, mechanical-draft equipment, automatic controls and accessories". Promotes these packaged generators.

14734* First Steel-Mill Gas Turbine in Britain. Phillip C. Secretan. *Power*, v. 102, Aug. 1958, p. 102 + 4 pages.

Burns blast-furnace gas to produce 2500-kw. net output with 1200 F inlet gas temperature. Unit uses three regenerators in parallel and a single combustion chamber.

14735 Thinking About Aircraft Engines. A. A. Lombard. *Shell Aviation News*, 1958, no. 240, June, p. 14-17.

Represents a quick sketch of the future development of aircraft engines.

14736* (German.) Inlet and Outlet Shocks on Turbine Blades. **Aus- und Eintrittsstösse an Schaufelgittern.** Adolf Busemann. *Zeitschrift für Angewandte Mathematik und Physik*, v. 9b, nos. 5/6, Mar. 17, 1958, p. 191-202.

In cases of large gaps between stages, blades of zero thickness, and straight exit and entry zones, the methods of steady one-dimensional flow can shed light on the adaptability of the flow to transient conditions.

14737* (English.) **The Development of a Laminar Wing Type Turbine Bucket.** Hans Kraft. *Zeitschrift für Angewandte Mathematik und Physik*, v. 9b, nos. 5/6, Mar. 17, 1958, p. 404-421.

High deflection means that in most cases the effect of variable density must be considered.

See also: **14120** (aircraft jet deflector); **15236** (plastics for liquid rocket engines); **15297** (composite solid rocket fuels).

INFORMATION—PREPARATION AND DISSEMINATION

14738 A Structure Code for Organic Compounds. Keith W. Wheeler, et al. *American Documentation*, v. 9, no. 3, July 1958, p. 198-207.

14739* A Bibliography of Diffusion of Gases, Liquids and Solids in Solids, 1890 to 1955. Frank E. Jaumot, Jr. 314 pp. 1958. U. S. Atomic Energy Commission, Technical Information Service Extension, Oak Ridge, Tenn. (ZQC185 Un3.1 Ref.)

A relatively exhaustive bibliography favoring diffusion in metals.

14740 What the Morton Collectanea Does. Julia A. Morton. *Chemurgic Digest*, v. 17, Aug. 1958, p. 11-12.

Describes extensive botanical subject files at the University of Miami and the plan by which they are organized. The plan is to physically dissect, species by species, basic reference works with the broadest topical coverage, to process, taxonomize and house the resulting excerpts in vertical folders in filing cabinets.

14741* (German.) The General Importance of Documentation. **Die allgemeine Bedeutung der Dokumentation.** Ernst Rickli. *Chimia*, v. 12, no. 6, June 1958, p. 162-165.

Origin, nature, and output of books, reviews, and patents, especially of scientific publications in the last two decades. Documentation as the gathering, recording, and preparing of technical data. Various forms, problems, and techniques.

14742* (German.) Documentation in the Chemical Industry. **Dokumentation in der chemischen Industrie.** E. Auer. *Chimia*, v. 12, no. 6, June 1958, p. 165-174.

Patents as a necessary source of information for the chemical industry. Reports of new patents on microcards. International decimal classification. Different punched card systems.

14743* (German.) Experiments With Simple Accessories (Notched, Slotted, and Punched Cards). **Erfahrungen mit einfachen Hilfsmitteln (Rand-, Schlitz- und Sichtlochkarten).** H. Zschokke. *Chimia*, v. 12, no. 6, June 1958, p. 174-179.

For the individual chemist punched cards are useful adjuvants in preparing a literature card index. Principles and possibilities of different systems; applications.

14744* An Annotated Bibliography on Coal. Parke O. Yingst. *Colorado School of Mines, Quarterly*, v. 53, no. 3, July 1958, 102 pp.

Deposits; products; composition; cleaning; coking; gas turbines; waste products; coal research; coal vs. atomic power.

14745* A Comprehensive Bibliography on Operations Research Through 1956 With Supplement for 1957. George Shortley, editor. 188 pp. 1958. John Wiley & Sons, New York. (ZHD20 C26.5c Ref.)

Contains references published through Dec. 1957. Includes approximately 3000 titles of articles and 40 specialized bibliographies.

14746* (French.) Critical Bibliography Concerning the Methods of Measurement of Dynamic Surface Tensions. **Bibliographie critique sur les méthodes de mesure des tensions superficielles dynamiques.** R. Defay and J. Hommelen. *Industrie Chimique Belge*, v. 23, no. 6, June 1958, p. 597-614.

Measurements taken on flowing liquids and on surfaces which are practically motionless are reviewed.

14747 Information and Communication Practice in Industry. T. E. R. Singer, editor. 304 pp. 1958. Reinhold Publishing Corp., New York. (Z1001 Si64i)

Technical writing, editing, illustrating, and classification; information services and their part in internal communications; operations research; patent collections; research files; mechanical aids to presenting technical papers; punched cards; training the literature scientists; translating; designing tables of data; indexing and abstracting.

14748 Technical Communications in Defense Industry. F. N. Eddy. *IRE Transactions on Engineering Management*, v. EM-5, no. 2, June 1958, p. 49-54. (TK1 In6.6em Vis.)

Attempts to show the importance of such communications, to survey and evaluate current systems employed for both internal and external communications, and to suggest possible alternative systems for ameliorating extant problems.

14749* Society of American Foresters Check List of Forestry Items in a Working Library, 1958. Mary Lida Eakin. *Journal of Forestry*, v. 56, Aug. 1958, p. 586-591.

14750* Russian Current Bibliographies, 1772-1917. Karol Maichel. *Library Quarterly*, v. 28, no. 1, Jan. 1958, p. 38-44.

Historical survey of bibliographical journals published in Russia up to the time of the Bolshevik Revolution.

14751* A Literature Survey on the Physical Chemistry, Analysis, and Recovery and/or Disposal of Hydrofluoric Acid. Earl W. Mautz. 25 pp. 1958. National Lead Company of Ohio, Cincinnati. (ZQD181.F1 Un3.1L Ref.)

A listing of literature references.

14752 How to Set Up a Writing Program for Engineers. Paul R. Heinmiller. *Machine Design*, v. 30, Sept. 4, 1958, p. 104-108.

Practical suggestions on how companies can encourage their engineers to take an active part in presenting technical papers and writing articles.

14753 Molybdenum Metallurgy, a Bibliography. B. A. Lipetz, G. A. Bonnell, J. S. Parry, and E. J. Seiff. Paper from "The Metal Molybdenum, Symposium Proceedings". p. 572-690. 1958. American Society for Metals, Cleveland. (TN799.M7 M56)

The bibliography is arranged in reverse chronological order by year of publication, with references listed alphabetically by author. Material is compiled back through the year 1900.

14754* Latin—or Russian? C. B. Goodhart. *New Scientist*, v. 4, July 10, 1958, p. 361-362.

Argues that the national handicap of ignorance of Russian can be permanently overcome only by teaching Russian in the schools in place of now compulsory Latin.

14755 Notes on Writing Scientific Reports. J. Wilbur-Ham. 30 pp. Dec. 1957. Australian Defence Scientific Service, Maribyrnong, Victoria. (P7 Au78.2n Over.)

General procedures for planning, arranging, and use of illustrations and tabular data.

14756 Bibliography on Metal Finishing Wastes, 1957. C. F. Gurnham and D. G. Foulke. *Plating*, v. 45, Aug. 1958, p. 851-852.

14757* The Bibliographic Research Team. Marjorie Y. Fizette, Bruce E. Jones, and Robert W. Gibson, Jr. *Special Libraries*, v. 49, no. 6, July-Aug. 1958, p. 253-255.

The efficiency of research work can be greatly improved by utilizing information specialists as an integral part of the research team. At Battelle a team concept of bibliographic preparation has been evolved. The team is made up of an information specialist, technically trained along a general, rather than specific course, and a subject expert, one who is working in or is well acquainted with the field in question. By frequent consultation, the team establishes a field of search which is concise yet adequate within a limited time or budget.

14758 Technical Editing. B. H. Weil, editor. 278 pp. 1958. Reinhold, New York. (PN162 W42t)

Deals with editing as a primary communications step and relates the documents of all technical areas to the cardinal purpose of serving the potential reader.

14759* Russian-English Glossary of Aeronautical and Miscellaneous Technical Terms. *U. S. Air Force, Wright Air Development Center, PB* 131634, Nov. 1956, sections individually paged. (TL509 Un3.18r Ref.)

14760 Guide to Coverage and Scope of Nuclear Science Abstracts. *U. S. Atomic Energy Commission, TID*-4552 (1st. Rev.), Apr. 1958, 9 pp. (UF767 Un3ti Contin.)

Coverage, scope, and list of periodicals abstracted by *Nuclear Science Abstracts* are detailed.

***See also:* 14576** (electronic reliability bibliography).

INSTRUMENTATION

14761 Recent Developments in Electron Microscopy. V. E. Cosslett. *British Journal of Applied Physics*, v. 9, July 1958, p. 253-256 + 3 plates.

14762 The Analysis of Particle Counts by the Spray-Drop Method. K. I. Williamson and W. B. Taylor. *British Journal of Applied Physics*, v. 9, July 1958, p. 264-267.

14763 The Chromatic Field Aberrations and Their Correction in a Three Lens Reflexion Electron Microscope. D. H. Page. *British Journal of Applied Physics*, v. 9, July 1958, p. 268-270.

The coefficient of the chromatic difference in magnification for a three lens reflexion electron microscope is found to be a function of the focal length of the intermediate lens and the axial position of the objective aperture. A condition is shown to exist for which the coefficient vanishes and the aberration is then corrected.

14764 Solid Angle Corrections to Single Scattering. F. F. Heymann and P. I. P. Kalmus. *British Journal of Applied Physics*, v. 9, July 1958, p. 271-272.

Corrections relating the average intensity of particles, scattered into an aperture of finite solid angle to the intensity at the center of the aperture are given for rectangular and circular apertures. The dependence of the corrections on aperture shape and scattering angle is calculated for electrons scattered according to the simple Mott formula.

14765 Electric Furnaces. C. A. Otto, editor. 248 pp. 1958. George Newnes, Ltd., London. (TK4661 Ot8e)

Description and operation of furnaces for use in the metallurgical, vitreous enameling, plastics, glass, and pottery industries.

14766 Electronic Measuring Instruments. E. H. W. Banner. 2nd Rev. Ed. 496 pp. 1958. MacMillan, New York. (TK7870 B22e2)

Fills the need for a book with wide readership and scope, but without too much of the detail to be found in specialized papers which would have made this book too cumbersome and expensive. Digital and analogue computers are not included as such.

14767* New Explosive-Mixture Detector Safeguards Engine Tests. R. E. Gorton and G. J. Lyons. *ISA Journal*, v. 5, Aug. 1958, p. 31-35.

An improved automatic lower-explosive-limit detector is described.

14768 Liquids for Particle Size Analysis by Sedimentation Method. G. D. Joglekar and B. R. Marathe. *Journal of Scientific & Industrial Research*, v. 17, sec. A, May 1958, p. 197-203.

Available data on liquids suitable for a variety of powdered materials are presented and the various factors involved in their selection are critically assessed on the basis of the physicochemical characteristics of the liquids and the powders. Also, the methods commonly employed for dispersing powders in liquids are reviewed together with the tests employed for evaluating the degree of dispersion of the particles.

14769 A Compact and Versatile Fraction Collector. A. Snow, F. A. E. Porter, and A. W. Tomalin. *Journal of Scientific Instruments*, v. 35, no. 7, July 1958, p. 243-244.

Tubes are arranged spirally to conserve space, but each tube is brought in turn directly under the column in order to avoid mixing of successive drops in any connecting tube.

14770 A Spectrograph Attachment for High Speed Cameras. D. P. C. Thackeray. *Journal of Scientific Instruments*, v. 35, no. 7, July 1958, p. 248-252.

Above will convert any camera into a spectrograph. Used with two typical high-speed cameras, time resolved spectrography of small sources is possible with a wavelength resolution of 3 Å at 5780 Å and resolution times down to less than 10^{-7}S.

14771 An Apparatus for the Viscometry of Organic Liquids at High Temperature. W. G. Burns, B. Morris, and R. W. Wilkinson. *Journal of Scientific Instruments*, v. 35, no. 8, Aug. 1958, p. 291-293.

Apparatus is suitable for the measurement of the viscosity of organic liquids at temperatures up to 400 C.

14772* A Reference Wedge X-Ray Gage. Stanley Bernstein. *Nondestructive Testing*, v. 16, no. 4, July-Aug. 1958, p. 305-312.

A recently developed thickness gage, unusual in its high stability, simplicity, and versatility. High stability is achieved by the use of a direct comparison system. It has a relatively small number of components and few critical adjustments.

14773* Simple, Gas-Tight Furnace for Induction Heating. R. D. Grinthal. *Powder Metallurgy Bulletin*, v. 8, nos. 3/4, June 1958, p. 68-69.

A simple, relatively inexpensive furnace was constructed for use in conjunction with an induction heating source. Atmosphere can be either high vacuum or purified gas at positive pressures. Temperatures up to 1900 C have been attained using a 6 kw. spark gap generator as a power source. The furnace consists essentially of a 2½-in. diameter glazed quartz tube with its ends sealed by brass sections cushioned by "O" rings. Susceptor and heat shields may be fabricated from a variety of materials depending on the temperature and atmosphere requirements.

14774 Pressure Measurement in Vacuum Systems. J. H. Leck. 144 pp. 1957. Reinhold, New York. (QC166 L49.5p)

Of the five types of gage considered, the mechanical and radiometer manometers are absolute, in the sense that they measure pressure directly as the force upon a solid surface or liquid column. The remaining three types of gage described are indirect, in that they involve the measurement of some secondary phenomenon which is pressure-dependent, and only after being calibrated against one of the absolute manometers can they be used for pressure measurement.

14775* Development of the Calorimeter Heat Transfer Gauge for Use in Shock Tubes. Peter H. Rose. *Review of Scientific Instruments*, v. 29, July 1958, p. 557-564.

This heat transfer gage is suitable for measuring extremely high heat transfer rates under the quasi-transient conditions occurring in shock tubes. It is based on a calorimetric principle and is made possible by the short steady state times inherent in shock tubes. The techniques developed extends, verifies, and supplements the shock tube heat transfer measurements made by thin film resistance thermometers.

14776 Glass Dewars for Optical Studies at Low Temperatures. L. J. Schoen, L. E. Kuentzel, and H. P. Broida. *Review of Scientific Instruments*, v. 29, July 1958, p. 633-638.

A number of Dewars, offering advantages of economy, simplicity, and flexibility, are described and their relative merits discussed.

14777 Microscopic Examination of Interior or Highly Curved Surfaces by Means of Replicas. A. P. Young. *Review of Scientific Instruments*, v. 29, July 1958, p. 661.

Replicas can be used for either light or electron microscopy of interior or curved surfaces. Because they can be made on the site, they can also be used for surface examination of parts which cannot be conveniently moved.

14778 Ionic Vacuum Pumps. Lewis D. Hall. *Science*, v. 128, Aug. 8, 1958, p. 279-285.

Theory; history; description; future trends.

14779* (French.) Omegatron-Type Vacuum Leakage. **Un détecteur de fuites du type omegatron.** D. Charles and R. J. Warnecke, Jr. *Vide*, v. 13, no. 73, Jan.-Feb. 1958, p. 25-45.

Leaks of the order of 10^{-8} mm.^{3} atm./hr. can be detected.

See also: **14707** (oil drilling instrumentation).

LUBRICATION AND FRICTION

14780* Flexible Bearings. *Automobile Engineer*, v. 48, no. 7, July 1958, p. 255-259.

Fundamental principles involved in the employment of rubber and nylon bushings.

14781 On the Boundary Lubricity of Non-Polar Hydrocarbon Oils and Their Mixtures. Yasukatsu Tamai. *Institute of Petroleum, Journal*, v. 44, July 1958, p. 207-211.

Lubricating properties of benzene, cetane, decalin, and di-*cyclo*-hexyl methane.

14782 Plastic Ball and Roller Bearings. Joseph E. Montalbano. *Machine Design*, v. 30, Aug. 7, 1958, p. 96-99.

Advantages, applications, and limitations.

14783* Sensory Examination of Lubricating Greases. Albert S. Orr. *NLGI Spokesman*, v. 22, no. 5, Aug. 1958, p. 221-225.

Proposes a standard vocabulary of terms for describing the sensory observations of a lubricating grease. Some of the methods and equipment used to assure shipment of greases having uniformity of color, appearance, texture, and odor are presented.

14784* Pyrogenic Silica-Thickened Greases. Peter B. Marsden. *NLGI Spokesman*, v. 22, no. 5, Aug. 1958, p. 230-234.

Poly-alkylene glycols were found to improve water resistance, shear stability, and consistency. Tests indicate that considerable improvement in the three properties investigated can be obtained by the correct choice of additives.

14785* (Romanian.) The Effect of Turbulence on Motion in the Lubricant Layer. **Influenta turbulenței asupra mișcării în stratul de lubrifiant.** V. N. Constantinescu. *Studii și Cercetări de Mecanică Aplicată*, v. 9, no. 1, 1958, p. 103-137.

Equations of lubrication under turbulent conditions, starting from the general Reynolds equations. Distribution of velocities based on the hypothesis of Prandtl concerning the length of turbulent mixture.

14786 Effect of Metals on Lubricants. John B. Christian. *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 54-576, pt. 3, May 1958, 23 pp. (TL507 Un3.18w Vis.)

Shows the effects which an ester and a disiloxane have on various metals, and the effects which those metals simultaneously have on the fluids at elevated temperature (550 F). The disiloxane proved to be compatible with all of the metals tested, while the ester showed signs of being generally incompatible with all of the metals.

14787* The Effect of Lubricant Inertia in Hydrostatic Thrust-Bearing Lubrication. J. F. Osterle and W. F. Hughes. *Wear*, v. 1, no. 6, June 1958, p. 465-471.

The customarily neglected effect on the load capacity of hydrostatic thrust-bearings of the lubricant inertia is examined for both liquid and gaseous lubricants. It is found that for liquid lubricants, load capacities calculated by neglecting inertia can be significantly in error even at normal operating speeds. For gaseous lubricants, the effect is the same for low recess pressures, but tends to lessen at higher recess pressures.

14788* On the Mechanism of Wear Between Metal Surfaces. G. Yoshimoto and T. Tsukizoe. *Wear*, v. 1, no. 6, June 1958, p. 472-490.

The analysis of the mechanism of wear is dependent on the distribution of the real area of contact. Assuming a simple model which represents the profile curve of the metal surface, the number and size of the individual areas of contact can be deduced theoretically. Considering three types of wear for steel or cast iron (mechanical wear, Fe_2O_3 film wear, and Fe_3O_4 film wear), the theoretical wear rate concerning each type of wear can also be deduced.

14789* A Simple Apparatus for Studying the Wear of Tungsten Carbide. J. Golden and G. W. Rowe. *Wear*, v. 1, no. 6, June 1958, p. 491-498.

Describes a simple apparatus which has been used for experiments on the transfer of radioactive WC to steel and Cu during moderate speed sliding under various conditions. A flat plate of metal 6-in. in diameter is rotated beneath a small WC slider which carries loads up to 4 kg. and moves radially inwards. The resulting wear track forms a close spiral about 20-ft. long. A great advantage of the method is that zones of the metal plate can be treated differently and the effects on transfer of the active slider can be studied in detail from autoradiographs.

14790* Review on Marginal and Partial Hydrodynamic Lubrication. H. Blok. *Wear*, v. 1, no. 6, June 1958, p. 499-511.

A survey of the problems that arise when conditions are adverse to full realization of hydrodynamic lubrication.

See also: **15260** (viscosity of polybutenes).

MECHANICAL ENGINEERING

14791* (English.) **An Approximate Method for the Analysis of Disks by Decomposition Into Strips.** H. Craemer. *Acta Technica Academiae Scientiarum Hungaricae*, v. 21, nos. 1-2, 1958, p. 3-10.

The disk is considered to be composed of a sufficient number of strips and the bending stresses are assumed to be linear between any two contact-lines. Then, taking into account the geometrical conditions valid for two adjoining strips, two simultaneous differential equations of second order and one of the fourth order can be derived for each strip.

14792* (English.) **Investigation Into the Deformation of Shafts and the Problem of Minimizing Deformation.** I. Lipka. *Acta Technica Academiae Scientiarum Hungaricae*, v. 21, nos. 1-2, 1958, p. 27-45.

14793* (English.) **Graphical Kinematic Analysis Methods. Application of Rotated Vectors.** L. Buzás. *Acta Technica Academiae Scientiarum Hungaricae*, v. 21, nos. 1-2, 1958, p. 87-111.

Three graphical methods of kinematic analysis are compared from the point of view of their practical utility. A general survey of the principles on the basis of which the motion of plane mechanisms may be determined promptly and exactly by the strict graphical method of rotated vectors is given. Practical applications of the method are illustrated by means of two-link kinematic chains and some simple mechanisms constructed of such chains.

14794* Variably Reinforced Circular Holes in Stressed Plates. Raymond Hicks. *Aeronautical Quarterly*, v. 9, pt. 3, Aug. 1958, p. 213-231.

Expressions are obtained for the radial, tangential, and shear stresses in an infinite plate containing a variably reinforced circular hole. The variation in the cross-sectional area of the reinforcement is chosen so that the maximum tensile resistance of the reinforcement occurs at points around the hole where the stresses in the plate tend to be high. When the reinforcement has a given weight, the effect of varying its cross section is to reduce the stress concentration in the plate.

14795 Prediction of Creep in Bending From Tension- and Compression-Creep Data When Creep Coefficients Are Unequal. W. N. Findley, J. J. Poczatek, and P. N. Mathur. *ASME, Transactions*, v. 80, no. 6, Aug. 1958, p. 1294-1298.

The stress distribution and position of the neutral axis in a beam changed with time when the creep in tension and compression were unequal, and the stress distribution changed with time when the time-dependent and time-independent stress functions were unequal. Computed creep deflections are compared with available data on canvas laminate and polystyrene, with good results for the former and fair results for the latter.

14796 Application of the Analog Computer to Product Dynamic Performance in Typical Hydraulic Circuits. Gerhard Reethof. *ASME, Transactions*, v. 80, no. 6, Aug. 1958, p. 1299-1307.

The instabilities of a certain open-center hydraulic-booster system are simulated, and corrective action is indicated and verified. The study involves the analysis of a grossly nonlinear system and methods of function generation are given.

14797* Anti-Skid Device. *Automobile Engineer*, v. 48, no. 7, July 1958, p. 248-254.

Describes how an auto fitted with a Maxaret anti-skid device on each wheel can be steered, to avoid a succession of obstacles, while the brakes are fully applied.

14798* Two-Stage Rotary Screw Compressors. Installation and Operating Experience. *Canadian Mining Journal*, v. 79, Aug. 1958, p. 75-78.

An interesting new type of compressor developed in Sweden which is similar to a Roots blower, but with a spiral twist in the rotors.

14799* Buckling of Sandwich Constructions Beyond the Elastic Limit. E. I. Grigoljuk. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 4, July 1958, p. 253-266.

The stability of elastic-plastic sandwich shells of an arbitrary shape was investigated on the assumption that, at the moment of buckling, the load-carrying faces are in a fully plastic state and the core remains elastic. The equations are obtained on the basis of both the deformation theory and the plastic flow theory. The flexural stiffness of the faces is taken into account. The equations obtained permit the prediction of the critical loads of columns, plates, and shells of arbitrary form.

14800* A Reciprocal Property of the Finite Plane Strain Equations. J. E. Adkins. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 4, July 1958, p. 267-275.

A reciprocal property is established for the equations of finite plane strain superposed on uniform extension for isotropic and transversely isotropic, incompressible elastic materials. Given any solution which expresses the displacements as functions of the initial coordinates of any point of the body, it is possible to derive a second solution in which the displacements are corresponding functions of the final coordinates. This result, which is independent of the functional form of the strain-energy function, is illustrated by examples.

14801* Plastic Behavior of Compression Members. J. S. Ellis. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 4, July 1958, p. 282-300.

Theoretical and experimental investigation of the plastic behavior of mild steel compression members of annular cross-section when subjected to end loads of equal and unequal end eccentricities. A method of analyzing columns in a framework is advanced.

14802 Torsional-Vibration Absorber. Ching-U Ip and Ivan E. Morse. *Machine Design*, v. 30, Aug. 7, 1958, p. 93-95.

Variable-speed device accommodates changes in the frequency of impressed vibrations.

14803 Thermal Stresses in Design. III. Basic Concepts of Fatigue in Ductile Materials. S. S. Manson. *Machine Design*, v. 30, Aug. 7, 1958, p. 100-107.

Stress-strain mechanisms; metallurgical aspects; quantitative analysis; failure by plastic-strain cycling.

14804 Tables and Equations Simplify Design of Conical-Disc Springs for Large Loads and Small Deflections. Earlwood T. Fortini. *Machine Design*, v. 30, Sept. 4, 1958, p. 139-145.

Gives basic equations and design data.

14805 Paper as an Engineering Material. Malcolm W. Riley. *Materials in Design Engineering*, v. 48, Aug. 1958, p. 107-118.

Data to help in determining where to use paper materials and how to work more intelligently with paper suppliers. It covers types of papers, special treatments, applications, and properties and tests.

14806 Materials and Methods of Architectural Construction. Harry Parker, Charles Merrick Gay, and John W. MacGuire. 3rd Ed. 724 pp. 1958. John Wiley & Sons, New York. (TH145 P22m3)

Characteristics of building materials; structural members; design formulas; working unit stresses.

14807 1958 Design Data Manual. John P. Dubois, editor. 255 pp. 1958. Rogers Publishing Co., Englewood, Colorado. (TJ151 D46d Ref.)

Selected design data articles from the pages of *Design News* during 1957.

14808 (Ukranian.) Electrical Analogy Methods Applied to Nonlinear Vibration Problems. **Elektromodeliuvannia kolivan' pruzhnikh sistem z neliniĭnim zaglushenniam.** M. G. Gorchakov. *Prykladna Mekhanika*, v. 4, no. 2, 1958, p. 205-210.

Describes the plant designed for solving similar problems by means of electrical analogies, which has been built.

14809* (Italian.) Instability Problems in the Field of Steel Construction. **Problemi di instabilità nel campo delle costruzioni in acciaio.** Luigi Stabilini. *Ricerca Scientifica*, v. 28, no. 3, Mar. 1958, p. 465-485.

A survey of the principal cases of elastic instability in simple beams, trusses, and flat and dished plates. Fallacious results deriving from some oversimplified methods of computation.

14810 High Temperature Pressure Transmitter Evaluation. W. R. Miller. *U. S. Atomic Energy Commission, ORNL-2483*, July 21, 1958, 38 pp. (UF767 U3o Contin.)

The purpose of the evaluation program was to interest commercial vendors in making available several high-temperature pressure transmitter designs of proven reliability for both pressure and flow applications. The models and test results are given.

14811 An Investigation of the Stresses in a Discontinuity Region of a Pressure Vessel. B. L. Greenstreet. *U. S. Atomic Energy Commission, ORNL-2537*, July 21, 1958, 57 pp. (UF767 U3o Contin.)

A thin-walled cylindrical pressure vessel was held at 1500 F in an inert atmosphere until creep rupture occurred. The vessel was made of Inconel, and it had a flat plate head at one end. This configuration yielded high discontinuity stresses in the region of the head to shell junction. As the vessel deformed due to creep of the material, its configuration changed. Effect of this continual change on stress distribution was determined.

See also: **14114** (buckling of panels); **14250** (load testing of concrete girder).

METALLURGY

14812 The Engineering Properties of Commercial Titanium Alloys. M. W. Mote, R. B. Hooper, and P. D. Frost. *Battelle Memorial Institute, Titanium Metallurgical Laboratory, TML Report No. 92*, June 4, 1958, sections individually paged. (TN799.T5 B32.7t Vis.)

A revision of Titanium Metallurgical Laboratory Report No. 15, "The Engineering Properties of Commercial Titanium Alloys". The purpose of the present report is to provide a means for the reader and user of Ti to become familiar with the general characteristics of the various commercially available Ti mill products.

14813 Where Is Russia Headed in Metalworking? C. G. Goetzel. *Iron Age*, v. 182, no. 9, Aug. 28, 1958, p. 57-59.

A first-hand account of current developments in the Soviet Union.

14814 High-Temperature Alloys: 1900-1958. F. S. Badger. *Journal of Metals*, v. 10, Aug. 1958, p. 512-516.

Three problems in development of materials for use above 2000 F are improved refractories for induction vacuum melting, new oxidation-resistant refractory alloys, and better impact resistance and ductility in ceramics, metal ceramics, and compounds.

14815 The Making, Shaping and Treating of Steel. 7th Ed. 1048 pp. 1957. United States Steel Corp., Pittsburgh. (TN730 C15m7 Over.)

A total of approximately 200 individuals have made contributions to this book ranging from authorship of entire chapters to extensive rewriting of existing material, supplying illustrative material, and critically reviewing and editing the manuscript.

14816 Manganese Steel. 128 pp. 1956. Oliver and Boyd, London. (TN757.M3 H11m)

Properties and applications of this "toughest steel known" are presented, some of it for the first time in complete form.

14817 High Strength Nonmagnetic Alloys. Harold Bernstein. *Materials in Design Engineering*, v. 48, Aug. 1958, p. 104-106.

Copper-base, Co base, Ti alloys, and stainless steels have the tensile and magnetic properties to make excellent safety tools.

14818 The Metal Molybdenum, Symposium Proceedings Sponsored by the Office of Naval Research, Held September 18-19, 1956 at Detroit, Michigan. Julius J. Harwood, editor. 696 pp. 1958. American Society for Metals, Cleveland. (TN 799.M7 M56)

Papers cover preparation, properties, applications, and structure of Mo and its alloys.

14819 Three New Heat-Treatable Titanium Alloys. *Metal Treating*, v. 9, no. 4, July-Aug. 1958, p. 12.

Crucible Steel Company of America announces the first heat-treatable all β-Ti alloy to be produced designated B 120 VCA, (austenitic-120,000 psi. minimum yield).

14820* (German.) The Noble Metals in Research and Industry. **Die Edelmetalle in Forschung und Industrie.** H. Wolf. *Metall*, v. 12, no. 7, July 1958, p. 585-598.

The present issue is devoted to the problem of production, analyses, use, and economy of the noble metals.

14821* (French.) Nodular Cast Iron. **Les fontes à graphite sphéroïdal.** *Metaux. Corrosion-Industries*, v. 33, no. 393, Mar. 1958, p. 191-242.

Four papers on theoretical considerations, production, properties, and applications.

14822* Ravenswood Works. F. L. Church. *Modern Metals*, v. 14, no. 6, July 1958, p. 68-73.

Details of a program costing more than a half-billion dollars which culminated May 29th in the activation of the hotline at Kaiser's $200 million integrated smelter and rolling mill near Ravenswood, W. Va. This work completes one of the most efficient mine - to - mill - to - market operations in the metals business.

14823* (German.) Production of Antifriction Bearing Steel With Regard to Purity From Slags and Exemption From Carbide Segregations to the Largest Possible Extent. **Die metallurgische Beherrschung der Schlackeneinschlüsse und Karbidseigerungen im Wälzlagerstahl.** Kurt Fellcht and Rudi Barz. *Neue Hütte*, v. 3, no. 6, June 1958, p. 341-350.

Melting. Testing results of non-metallic inclusions. Factors affecting the formation of carbide segregations: melting method, rolling, and annealing.

14824 A Perspective of Molybdenum-Base Alloys. Alvin J. Herzig. 32 pp. 1957. American Society for Testing Materials, Philadelphia. (TN607 G41)

This sixth Gillett Memorial Lecture describes properties of Mo-base alloys and effects of various additions.

14825* (French.) New Properties and Applications of Metals of Very High Purity. **Nouvelles propriétés et applications des métaux de haute pureté.** Georges Chaudron. *Revue de Métallurgie*, v. 55, no. 5, May 1958, p. 407-416.

It is possible to advance the purification of many common metals to contents of the order of p.p.m., bringing about new physical properties in widely varying fields. Results obtained with Al and Fe for some yrs. past are given, i.e. the competition between the phenomenon of polygonization and that of recrystallization; the high conductivity of these metals at low temperatures; their resistance to chemical attack; and the virtually complete suppression of certain diffusion phenomena.

14826 The Influence of Composition Upon the 1500°F Creep-Rupture Strength and Microstructure of Molybdenum-Chromium-Iron-Nickel Base Alloys. Thomas K. Roche. *U. S. Atomic Energy Commission, ORNL-2524*, July 9, 1958, 110 pp. (UF767 U3o Contin.)

An alloy within the composition range 15/17% Mo–6/7% Cr–4/6% Fe–0.04/0.08% C–balance Ni, designated as INOR-8, is an attractive structural material for use in a nuclear power reactor fueled with molten-U-bearing fluoride salts. The present study enlarges upon the technology of INOR-8 through an investigation of the influence of composition variation upon the 1500 F creep-rupture strength and microstructure of alloys encompassed by the range 10/20% Mo–5/10% Cr–4/10% Fe–0.5% Al–0.5% Mn–O.06% C–balance Ni.

14827 Problems Associated With Uranium Contamination of Zirconium and Zirconium Alloys. B. F. Rubin, P. W. Frank, R. S. Gilbert, and K. H. Vogel. *U. S. Atomic Energy Commission, WAPD-BT-6*, Jan. 1958, p. 58-63. (UF767 Un3.1 wb Contin.)

An investigation was launched to determine the amount of U naturally present in Zr and zircaloy scrap, the various effects of this amount, and the level of U contamination which can be tolerated.

14828 Interim Report: The Strengthening Effect of Beryllium on Zircaloy-3. R. E. Johnson and A. F. Steeves. *U. S. Atomic Energy Commission, WAPD-TM-81*, Aug. 16, 1957, 25 pp. (UF767 Un3.1wa Contin.)

The initial results of the program of alloying Zircaloy-3 with Be have proved that a strong, ductile, workable alloy can be made. The major difficulty in hot working is the possibility of liquation. Through a metallographic study of the as-cast and solution-heat-treated material, a maximum working temperature of 900 C was indicated and when the alloys were extruded below this temperature, they were found to be workable.

14829* (Russian.) Purification of Indium and Preparation of InSb Compound With High Mobility of Electrons. **Ochistka indiia i poluchenie soedineniia InSb s bol'shoi podrizhnost'iu elektronov.** V. M. Sergeeva and E. L. Shtrum. *Zhurnal Teknicheskoi Fiziki*, v. 27, no. 12, Dec. 1957, p. 2698-2701.

Preparation of high mobility InSb compounds by additional purification of initial materials (especially In as most contaminated) by fractional distillation in a horizontal quartz tube consisting of three sections. Practical use of the InSb compound obtained.

14830 Zinc. A Mine to Market Outline. American Zinc Institute. 96 pp. 1958. American Zinc Institute, Inc., New York. (HD 9539.Z6 Am35z)

Presents some of the basic facts concerning its importance, processes of manufacture, properties, and applications.

See also: **14753** (bibliography of Mo metallurgy); **14765** (electric furnaces).

METALS—CORROSION

14831* (German.) The Effect of Different Impurities on the Corrosion-Resistivity of Super-Pure Aluminum in Water of High Temperature and High Pressure. **Einfluss verschiedener Verunreinigungen auf den Korrosionswiderstand des Reinstaluminiums im Wasser bei erhöhten Drücken und Temperaturen.** A. Domony. *Acta Technica Academiae Scientiarum Hungaricae*, v. 21, nos. 1-2, 1958, p. 123-139.

14832* Corrosion Considerations in System Design. S. Clifford Jones. *American Gas Journal*, v. 185, Aug. 1958, p. 40 + 1 page.

14833 Sulfuric Acid Corrosion in Oil-Fired Boilers—Studies on Sulfur Trioxide Formation. Donald R. Anderson and Frank P. Manlik. *ASME, Transactions*, v. 80, no. 6, Aug. 1958, p. 1231-1238.

Shows that a high H_2SO_4 production level can result from the presence of certain fuel ash constituents. A pilot-plant size experimental oil-fired boiler was used in studying the problem of H_2SO_4 corrosion in air heaters and economizers.

14834 An Index of Cavitation Erosion by Means of Radioisotopes. S. L. Kerr and Kjell Rosenberg. *ASME, Transactions*, v. 80, no. 6, Aug. 1958, p. 1308-1314.

Use of an insoluble radioactive coating on a runner blade in a hydraulic turbine.

14835* (French.) Fight Against Sea Corrosion of Steel With Cathodic Protection and With Paint. **Lutte contre la corrosion marine de l'acier par protection cathodique et par peinture.** M. Fonteyn. *Centre Belge d'Étude et de Documentation des Eaux, Bulletin No.* 40, 1958, p. 101-102.

Simultaneous action by both means produces practically a total prevention against sea corrosion.

14836* (French.) Relationships Between the Purification of Aluminum and Its Reactivity to Etch Figure Reagents. **Relations entre la purification de l'aluminium et sa réactivité vis-à-vis des réactifs à figures de corrosion.** Gérard Wyon and Paul Lacombe. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences,* v. 246, no. 26, June 30, 1958, p. 3625-3628.

The preponderant part of Fe in the attack of Al by means of these reagents was confirmed by a simple purification method by high vacuum melting and progressive solidification. As a consequence, the sub-boundaries are no longer attacked by the etch figures.

14837* (French.) Some Interesting Properties of the General Electric Field. **Quelques propriétés interessantes du champ électrique général.** D. Petrocokino. *Corrosion et Anticorrosion,* v. 6, nos. 7-8, July-Aug. 1958, p. 241-251.

Physical properties of the protective paint or varnish coating on metal surfaces. Adsorption on the metallic interface; modern theory of the double layer, corrosion mechanism from the thermodynamic or electrokinetic point of view. The electric static field as a corrosion factor. Application to the study of corrosion of grounded or submerged structure.

14838* (French.) Vapor-Phase Inhibitors. **Les inhibiteurs en phase vapeur.** Giorgio Mantovani. *Corrosion et Anticorrosion,* v. 6, nos. 7-8, July-Aug. 1958, p. 258-264.

A study of mopholine, camphor, aniline and other inhibitors to protect metallic surface against atmospheric corrosion, especially before use of the metallic products. Water solubility, fusion point, boiling point, and vapor tension.

14839* The Protection of Double Bottom Tanks. K. G. C. Berkeley. *Corrosion Prevention and Control,* v. 5, no. 7, July 1958, p. 43-46.

Application of cathodic protection to the above style of ship tanks.

14840 The Microtopography of Oxide Films on Niobium. J. V. Cathcart, J. J. Campbell, and G. P. Smith. *Electrochemical Society, Journal,* v. 105, Aug. 1958, p. 442-446.

The apparently anomalous oxidation rate behavior of Nb is explained in terms of the formation of small, blister-like cracks in the oxide film. An oxidation model, based on the idea that an oxidation process which is maintained by interstitial-anion or anion-vacancy diffusion leads to the generation of stresses in the oxide film, is proposed to account for these results. The observation of similar blister-like cracks in oxide films on Ta is also reported.

14841* Industry Fights Corrosion. 107 pp. 1957. Corrosion Technology, London. (TA462 C81i Over.)

This volume contains the full texts of 13 papers delivered at the Corrosion Convention held at Central Hall, Westminster, London, Oct. 15-16, 1957.

14842 New Corrosion Index Shows Nation's Rust Pattern. *Iron Age,* v. 182, no. 9, Aug. 28, 1958, p. 54-56.

An accurate picture of relative rusting rates in every major U. S. city.

14843 Corrosion of Metals by Liquid Mixed Fertilizers. J. D. Hatfield, A. V. Slack, G. L. Crow, and H. B. Shaffer, Jr. *Journal of Agricultural and Food Chemistry,* v. 6, July 1958, p. 524-531.

Both mild steel and stainless steel were satisfactorily resistant with practically all combinations of variables tested. Al resistivity ranged from unsatisfactory to satisfactory.

14844 The Water Wettability of Metal Surfaces. Donald J. Trevoy and Hollister Johnson, Jr. *Journal of Physical Chemistry,* v. 62, July 1958, p. 833-837.

By using highly refined handling techniques, contact angles in the range, 0-11°, were obtained on Al, brass, Cu, Mg, Ni, stainless steel, and Zn.

14845* (Russian.) Effect of Cathode and Anode Polarization on the Rate of Corrosion Cracking in Austenite Stainless Steel. **Vliianie katodnoĭ i anodnoĭ poliarizatsii na skorost' korrozionnogo rastreskivaniia austenitnoĭ nerzhaveiushcheĭ stali.** V. V. Romanov and V. V. Dobroliubov. *Metallovedenie i Obrabotka Metallov,* 1958, no. 7, July, p. 19-21.

Curves of polarization during cracking for steel 1 x 18 H9 in a boiling 42% $MgCl_2$ solution. Study under the microscope of the effect of polarization on the character of the cracks.

14846* Oil Rig Jackets Lick Offshore Corrosion Problem. *Modern Metals,* v. 14, no. 6, July 1958, p. 52.

Describes drilling structures which are also one-third weight of steel, mobile, and fast erecting.

14847 Studies Relating to the Reaction Between Zirconium and Water at High Temperatures. Alexis W. Lemmon, Jr. *U. S. Atomic Energy Commission, BMI-*1154, Jan. 3, sections individually paged, 1957. (UF767 U3b Contin.)

Emissivity measurements on zircaloy; the diffusion of O in α and β zircaloy 2 and zircaloy 3 at high temperatures; measurement of steam-zircaloy 2 reaction rates; and cooling mechanism of zircaloy 2 droplets in water.

14848 An Investigation of Uranium Corrosion in 100 C Water and 200 C Steam at Atmospheric Pressure. Oliver M. Stewart, Warren E. Berry, Paul D. Miller, Dale A. Vaughan, John B. Schroeder, Frederick W. Fink, and Charles M. Schwartz. *U. S. Atomic Energy Commission, BMI-*1271, June 19, 1958, 15 pp. (UF767 U3b Contin.)

Material balance in atmospheric-pressure water and steam corrosion of U were studied by examination of the phase composition and valence state of the corrosion product and by H-evolution measurements. The corrosion rates in atmospheric-pressure steam above 100 C are lower than those obtained in tests carried out in water with a H overpressure. The atmospheric-pressure-water corrosion product was found to be two phase: an oxygen-rich oxide, $UO_{2.2}$, and uncorroded metal particles. No hydride phase was detected. This was explained on the basis of H pressure in the reaction vessel.

14849 The Corrosion of Zircaloy Base Fuel Alloys in High Temperature Water. Stanley Kass. *U. S. Atomic Energy Commission, WAPD-TM-*123, Jan. 1958, 23 pp. (UF767 Un3.1wa Contin.)

The 680 F water corrosion behavior of Zircaloy-2 and -3 base U alloys with and without the addition of B is described. The corrosion of the alloys is characterized by the initial formation of a protective oxide film followed by a breakdown of the film and general spalling. The corrosion resistance of the alloys is affected by prior thermal history. The addition of minute amounts of B greatly influences the corrosion rates and heat treatment responses.

14850 Compatibility of Metals With Liquid Fluorine at High Pressures and Flow Velocities. Harold W. Schmidt. *U. S. National Advisory Committee for Aeronautics, Research Memorandum, RM* E58D11, July 15, 1958, 15 pp. (TL782 Un3rm Vis.)

Specimens of various metals in selected geometric configurations were exposed to liquid fluorine under controlled conditions of flow and pressure. None of the metal samples eroded, decomposed, or exhibited any measurable physical or chemical changes. In a run made with a Teflon sample, instantaneous chemical reaction and decomposition occurred.

See also: **14445** (ships' bottom paints and cathodic protection); **14446** (marine corrosion); **14640** (corrosion in boiler furnaces); **14931** (corrosion resistance of Zircaloy-2 and -3); **14974** (fretting corrosion).

METALS—EXTRACTION AND REFINING

14851* (Russian.) Equilibrium of Sulfur Distribution Between Metal and Slag in Open-Hearth Furnaces. **O ravnovesii raspredeleniia sery mezhdu metallom i shlakom v martenovskikh pechakh.** L. A. Shvartsman, et al. *Akademiia Nauk SSSR, Doklady*, v. 120, no. 3, 1958, p. 599-601.

For successful desulfurization of steel, suitable thermodynamic and kinetic conditions must be maintained in the slag; Si content must be decreased during the entire smelting; slag must be maintained sufficiently fluid by addition of fluidizers.

14852 Some Experiments With Steel Ingot "Hot Tops". M. E. Harnish and M. C. McQuarrie. *American Ceramic Society Bulletin*, v. 37, Aug. 1958, p. 357-360.

A small scale model study of the heat flow in the hot-top region was made and the effects of wall thickness, porosity, and covering materials upon the cooling rate of the metal investigated. The results indicate: increasing the wall thickness, within the limits studied, has a minor effect on the cooling time of the metal; increasing the porosity increases the cooling time; the use of a covering material has a marked effect on the heat losses and slows the cooling of the metal in the hot top.

14853* (Czech.) Causes of Formation of Blowholes in Some Types of Killed Steels. **Příčiny vzniku bublin u některých druhů uklidněných ocelí.** Jan Chvojka. *Hutník (Czech)*, v. 8, no. 6, June 1958, p. 199-203.

Review of causes of formation of blowholes and analysis of defects caused by them in processing of killed steel ingots. Detection and determination of these defects; precaution against rejects caused by blowholes.

14854 Furnace Sintering of Metals and Ceramics. I. R. L. Harper. *Industrial Heating*, v. 25, Aug. 1958, p. 1530 + 5 pages.

The types of furnaces used in making of parts by sintering of compacted powders of metals and ceramics (individually or combined), and metalizing of certain ceramic parts are described along with processes involved. (To be continued.)

14855 Continuous Casting at Barrow. I. M. D. Halliday. *Iron & Steel*, v. 31, no. 9, Aug. 1958, p. 417-419.

The physical properties of products rolled and forged from continuous cast billets and slabs have been found to be entirely satisfactory and in general, not distinguishable from those for good quality products derived from orthodox ingots.

14856 The Kaldo Process. Bo Kalling and Folke Johansson. *Iron & Steel*, v. 31, no. 9, Aug. 1958, p. 419-423.

In Kaldo as in the open-hearth process, the content of O is determined by the C-O relation, this differentiating it from the basic Bessemer process. Details of equipment and operation are given.

14857 Large Electric-Arc Furnace Steelmaking Experience in the U.S.A. A. C. Ogan and D. J. Carney. *Iron and Steel Institute, Journal*, v. 189, pt. 4, Aug. 1958, p. 307-314.

Trends in furnace design and equipment and present practices in the U.S.A. for production of plain C ingots, including the use of hot metal. The economics of electric furnaces vs. open-hearth furnaces for production of plain C ingots.

14858 Experience With Sinter Burden in Swedish Blast-Furnaces. Ulf Notini. *Iron and Steel Institute, Journal*, v. 189, pt. 4, Aug. 1958, p. 322-326.

Advantages offered by the use of self-fluxing sinter are judged so significant as to justify grinding, concentrating, and sintering the ore, even if the beneficiation does not increase the Fe content in the burden appreciably.

14859* (Swedish.) A Program-Controlled Reduction Test for Blast-Furnace Burdens. **Ett programstyrt reduktionsprov för masugnsbeskickningar.** Rolf Linder. *Jernkontorets Annaler*, v. 142, no. 5, 1958, p. 246-266.

Test was carried out in a barrel-shaped laboratory furnace. Degree of oxidation after termination of test at 1000 C indicates reducibility. Quantity of fines indicate disintegration during reduction. Satisfactory agreement was obtained between test and indirect reduction in blast-furnace.

14860 Hot Top Practice at Lukens Steel. R. L. Bunting, Jr. *Journal of Metals*, v. 10, Aug. 1958, p. 525-526.

Significant savings through in-plant production of cement hot tops.

14861 New Techniques for Copper Refining. E. F. Kurzinski. *Journal of Metals*, v. 10, Aug. 1958, p. 533-537.

Further study is required to determine if industrial gases can be used in refining Cu to give greater flexibility in controlling production rates and costs.

14862* (Italian.) A Contribution to the Knowledge of the Influence of Mixture Composition on Sintering Process. **L'influenza della composizione delle miscele sulle caratteristiche dell'agglomerazione.** G. Sironi. *Metallurgia Italiana*, v. 50, no. 5, May 1958, p. 181-190.

Self fluxing sinters at various basicity indices were produced by limestone to the mixes.

14863 New Process, New Plant—High Grade Iron From Inco's Concentrates. *Mining Engineering*, v. 10, Aug. 1958, p. 864-866.

A development by Inco solves the problem of excess Fe in a Ni mill product.

14864* (German.) The Working Behavior of Different Slag Compositions and Their Influence on the Production. **Das Verhalten der verschiedenen Schlackenzusammensetzungen im Betrieb und ihr Einfluss auf die Produktion.** Wolfgang Heerwagen. *Neue Hütte*, v. 3, no. 6, June 1958, p. 351-357.

Evaluation of slags. Treatment of red slurry; influence exerted by CaO; behavior of alumina; influence of other oxides; graphic evaluation of operating results; the importance ascribed to the viscosimeter.

14865* (Czech.) Making of Ferromolybdenum by Alumino-Silicothermic Method. **Otrzymywanie zelazomolibdenu metoda aluminosilikotermiczna.** Z. Kuliński and B. Paczuła. *Prace Instytutów Hutniczych*, 1958, no. 3, p. 143-145.

Method of producing ferromolybdenum employing a mixture of ferrosilicon and Al as reducing agent, which permits maintenance of Si content in metal within standard limits.

14866* (Czech.) Temperature Measurement With Suction Thermo-Couples of Air and Flue Gas in Open-Hearth Furnaces. **Pomiary temperatur powietrza i spalin w piecach martenowskich termopara odciagowa.** M. Michałowski. *Prace Instytutów Hutniczych*, 1958, no. 3, p. 147-151.

The results with an ordinary thermo-couple are always subject to error.

14867 For Refining Metals—There's Nothing Better Than Vacuum. L. W. Johnson. *Product Engineering*, v. 29, no. 33, Aug. 18, 1958, p. 72-74.

Turns out purer and stronger castings and leads to more reliable parts. Includes a ready-reference chart for eight systems.

14868* (Russian.) Low-Manganese and Low-Phosphorus Iron Smelting. **Vyplavka chuguna s nizkim soderzhaniem margantsa i fosfora.** B. N. Zherebin, V. P. Dembovetskiĭ, V. M. Minkin, and I. D. Nikulinskiĭ. *Stal'*, v. 18, no. 7, July 1958, p. 578-585.

Removal raised essentially the metallurgical value of Fe for the open-hearth process and, at the same time improved the blast-furnace performance indexes.

14869* (Russian.) Investigation of the Continuous Casting of Steel by Modeling. **Modelirovanie razlivki nepreryvnogo slitka.** K. I. Afanas'eva and G. P. Ivantsov. *Stal'*, v. 18, no. 7, July 1958, p. 599-604.

It was possible to define more accurately the hydrodynamic regularities of the metal flow in a cast billet and to develop the ways for improvement of dimensions and shapes of casting devices.

14870* (Russian.) A Rational Method for Ball-Bearing Steel Deoxidation in Acid Open-Hearth Furnaces. **Ratsional'noe raskislenie sharikopodshipnikovoĭ stali v kislykh pechakh.** V. A. Kudrin, E. I. Tiurin, and Iu. M. Nechkin. *Stal'*, v. 18, no. 7, July 1958, p. 606-607.

14871* (Russian.) Perspectives for Utilization of the Low-Grade Manganese Ores for Production of Ferromanganese and Silico-Manganese. **Perspektivy ispol'zovaniia nizkosortnykh margantsevykh rud dlia proizvodstva ferromargantsa i silikomargantsa.** E. M. Alekseev. *Stal'*, v. 18, no. 7, July 1958, p. 617-620.

Production from the carbonaceous and low-grade oxide Mn ores in the electric furnace is technically possible and economically expedient.

14872* (Russian.) Properties of the Oxygen-Blown Steel, Received in Converters. **Svoistva metalla, poluchennogo v konverterakh s produvkoĭ kislorodom.** P. Ia. Ryzhkov, A. A. Mitrofanov, N. I. Beda, and G. L. Livshits. *Stal'*, v. 18, no. 7, July 1958, p. 643-647.

Rimmed or killed steel by its technological and mechanical properties is practically equivalent to the corresponding open-hearth steel.

14873* (Russian.) Casting of Ingot Molds From Magnesium Iron Into Metallic Molds. **Otlivka izlozhnits iz magnievogo chuguna v metallicheskie formy.** G. A. Pisarenko, S. G. Guterman, Ia. I. Aĭzikovich, and P. D. Elokhov. *Stal'*, v. 18, no. 7, July 1958, p. 668-672.

See also: **14279** (metal chlorination plants).

METALS—FINISHING, POLISHING, AND CLEANING

14874* **Co_2 Removal and Recovery.** T. W. Sharp. *Chemical & Process Engineering*, v. 39, Aug. 1958, p. 269 + 5 pages.

A short review which considers some of the better known processes and to establish in a general way the particular conditions that determine which solution or combination of solutions shall be adopted.

14875 Modern Soaking Pit Installation at Allegheny Ludlum Steel Plant. *Industrial Heating*, v. 25, Aug. 1958, p. 1578 + 1 page.

14876* Electroplating Explained — A Course for the Working Plater. V. Trichlorethylene Degreasing. H. Hartley. *Product Finishing*, v. 11, Aug. 1958, p. 60 + 8 pages.

A general insight into the practical art of plating.

METALS—FOUNDRY PRACTICE

14877* Decarburization of White Irons Under Non-Graphitizing Conditions. C. T. Moore. *B.C.I.R.A. Journal of Research and Development*, v. 7, no. 6, June 1958, p. 258-261 + 2 plates.

In the initial stages of decarburization before graphitization commences, excess sulfur white irons decarburize more slowly than similar balanced sulphur white irons; also increasing the austenite/carbide area of interface increases the rate of decarburization in both balanced and excess sulfur white irons. Results obtained are consistent with the suggestion that in white irons, carbide solution in austenite is a limiting factor influencing the rate of C removal by gaseous decarburization. Free iron sulfide also seems to reduce the rate of solution of carbide in austenite.

14878* Dross Defects in Nodular Iron Castings. A. G. Fuller. *B.C.I.R.A. Journal of Research and Development*, v. 7, no. 6, June 1958, p. 268-285 + 32 plates.

Observations of the nature of the dross defect lead to the conclusion that it consists of a segregation of a mixture of MgS and MgO, and Al_2O_3, together with the oxides of Ca, Fe, Ni, Mn, and Si. Ladle additions of Te in conjunction with ladle additions of Ce have a very potent effect in reducing the incidence of dross defects. On a long-term basis, careful control of the Mg alloy addition and the Al content of the Fe is necessary if dross defects are to be minimized.

14879* (Dutch.) Operation of Low Frequency Coreless Melting Furnace. **Werking van laagfrequent kernloze smeltoven.** H. A. Baron van Raders. *Bedrijf en Techniek*, v. 13, no. 310, July 26, 1958, p. 594 + 2 pages.

Use is made of the frequency of the power supply voltage. No generator is needed to operate such furnaces.

14880 Casting in Steel. 112 pp. 1958. Sir Isaac Pitman & Sons, Ltd., London. (TS320 B77c)

Shows that steel castings could, with advantage, be applied over wider fields of engineering construction than they are at present if potential users and their engineers and designers were better informed as to the characteristics and functional attributes of cast steel components.

14881 Investment Casting With Frozen Mercury. *Engineering*, v. 186, Aug. 8, 1958, p. 177-178.

An investment process in which frozen Hg is used for the pattern, as an alternative to wax, has been perfected and is now being applied.

14882 Mechanized Molding Line is Fast and Flexible. William G. Gude. *Foundry*, v. 86, Sept. 1958, p. 62-65.

High-speed, automatic molding machines team up with efficient material handling to produce 200-220 molds hourly.

14883 Gray Iron Chilling Practice. Verne Pulsifer. *Foundry*, v. 86, Sept. 1958, p. 66-72.

Results of an investigation to provide information needed to obtain desired chill depth with various gray iron melt analyses by taking advantage of the range of physical properties of graphite.

14884 Shrinkage Prevention in Bronze Castings. Clyde L. Frear. *Foundry*, v. 86, Sept. 1958, p. 73-77.

Deals with effects of feeding on casting soundness. (To be continued.)

14885 Shaw Process Foundry Provides Economies for Tool Shop. Robert H. Herrmann. *Foundry*, v. 86, Sept. 1958, p. 114-116.

14886 Permanent Mold Casting of Zirconium-Thorium Alloys. Frank Gaines. *Foundry*, v. 86, Sept. 1958, p. 136 + 1 page.

The first permanent mold castings made of Zr-Th alloys of Mg are described.

14887 Foundry Manual. 291 pp. 1958. Bureau of Ships, Navy Department, Washington, D. C. (TS230 Un3.7f)

Intended primarily for use by foundry personnel aboard repair ships and tenders. The first section contains information of a general nature, such as how metals solidify, designing a casting, sands for molds and cores, gates, risers, and chills, and description and operation of melting furnaces. Subjects covered in these chapters are generally applicable to all of the metals that may be cast aboard ship. The second section contains information on specific types of alloys, such as copper-base alloys, aluminum-base alloys, cast iron, and steel. Specific melting practices, suggestions for sand mixes, molding practices, gating, and risering are covered in these chapters.

14888 Feeding Systems for Gravity Die-Castings. D. Miller. *Foundry Trade Journal*, v. 105, July 24, 1958, p. 109-111.

Describes and illustrates designs for runners, risers, and feeding systems.

14889* (German.) Contribution to the Problem of Deoxidation and Desulfurization in the Cupola. **Beitrag zur Desoxydation und Entschwefelung im Kupolofen.** Kurt Bandow and Karl Wagner. *Giesserei*, v. 45, no. 15, July 17, 1958, p. 409-417.

Deoxidation and desulfurization in the cupola; carrying out cupola tests; deoxidizing power of briquetted ferro-alloys in the cupola; slag basicity; Mn and S content of the Fe.

14890* (German.) Shooting Melting and Alloying Materials Into the Cupola. **Das Einschiessen von Schmelz- und Legierungsstoffen in den Kupolofen.** Alfred Rexroth. *Giesserei*, v. 45, no. 15, July 17, 1958, p. 417-420.

Possibilities of influences upon the melt; description of an apparatus and method of shooting-in materials with the aid of compressed air or gas; melting loss conditions; economic advantages.

14891* (German.) Stress Problems Encountered With Pressure Casting Dies. **Beanspruchungsprobleme bei Druckgiessformen.** Gustav Lieby. *Giesserei*, v. 45, no. 16, July 31, 1958, p. 437-443.

Discussion of the effects of external loads; loads caused by forces related to the mechanical strength of the die and the thermodynamic state of the die.

14892* (German.) Metallurgical Control of Quality in the Production of High-Quality Copper-Base Castings. **Metallurgische Voraussetzungen für die Herstellung von hochwertigen Gusserzeugnissen aus Kupferlegierungen.** A. R. French. *Giesserei*, v. 45, no. 16, July 31, 1958, p. 444-451.

Tin, Pb, and P bronzes; red brass; brasses; and Al bronzes.

14893 Preparation of Pure Metals by Levitation Induction Melting. *Industrial Heating*, v. 25, Aug. 1958, p. 1556 + 1 page.

Levitation melting is being used to prepare highly purified laboratory-scale ingots of Cb, Zr, Ti, Mo, and dozens of alloys.

14894 Slip Casting. L. M. Schifferli, Jr. *Journal of Metals*, v. 10, Aug. 1958, p. 517-521.

Making shapes from high-temperature material.

14895 Vacuum Melting Improves Investment Casting. J. A. Miller. *Journal of Metals*, v. 10, Aug. 1958, p. 522-524.

Application of the above has resulted in the production of superior quality castings.

14896* The Technique of Zone Melting. G. R. Whalley. *Laboratory Practice*, v. 7, Aug. 1958, p. 462-464.

A general review of the process.

14897 Why and Where to Use Centrifugal Castings. I. Ferrous Metals. John L. Everhart. *Materials in Design Engineering*, v. 48, Aug. 1958, p. 89-93.

(To be continued.)

14898 Chill Cast Brass Billets. *Metal Industry*, v. 93, July 25, 1958, p. 75-77.

Installation for extrusion billets at Delta Metal Co., Ltd.

14899 The Mercast Process. *Metal Industry*, v. 93, Aug. 1, 1958, p. 93-96.

Uses frozen Hg as the pattern material. Solid/liquid expansion is small; therefore, thin shell molds can be employed without fear of cracking the shell. Mercury readily welds to itself under light pressure, so that accurate and intricate patterns can be produced by abutting or "booking" simple component patterns together in a precision jig.

14900 Hollow Castings Without Cores. *Metal Industry*, v. 93, Aug. 1, 1958, p. 97.

A machine for producing hollow castings without the need for a core has been developed by Robar Products (London) Limited. A timing mechanism is incorporated which enables the core of the article cast to be evacuated while still in a molten state.

14901* How to Test and Evaluate Core Oil. Rodney L. Boyes. *Modern Castings*, v. 34, Aug. 1958, p. 24-25.

Four tests to evaluate core oil are presented.

14902* Solidification and Risering of Gray Iron Castings. Clyde M. Adams, Jr., Merton C. Flemings, and Howard F. Taylor. *Modern Castings*, v. 34, Aug. 1958, p. 31-41.

Experimental data and theoretical analyses are used to delineate the fundamental variables for determining shrinkage in gray iron.

14903* The Effect of Size of Scrap on the Tapping Temperature of a Cupola. N. H. Keyser and W. L. Kann, Jr. *Modern Castings*, v. 34, Aug. 1958, p. 59-60.

The study shows that, with a particular cupola, more coke is required for heavier scraps at a given tapping temperature with a fixed air blast, and temperature can be adjusted by controlling charged scrap characteristics.

14904* Packing Characteristics of Typical Foundry Sands. L. J. Pedicini. *Modern Castings*, v. 34, Aug. 1958, p. 83-86.

Deals with the compaction of some typical foundry sand distributions. Eleven sands are included in this study.

14905 Progress in the Development and Utilization of Additives in the Foundry Industry. J. A. Gitzen. 37 pp. 1957. J. A. Gitzen, Milwaukee. (TS243.5 G44p)

Describes the history and present status of additives.

14906* (Polish.) An Attempt to Establish for Cast Steel a Tentative Standard for Gating Systems in Order to Enable Their Performing in Refractory Shaped Pieces. **Próba ustalenia normatywu układów wlewowych, w celu umożliwienia wykonywania ich w kształtkach ogniotrwałych.** T. Sala. *Przeglad Odlewnictwa*, v. 8, no, 7, July 1958, p. 186-194.

Introduction of gating systems made of refractory shaped pieces in steel foundry using the method applied in the Soviet foundry in Novo-Krematorsk. Method of calculation of the tentative stand for gating systems; acception of the criterion of gravimetric pouring speed of the mold; calculation of gating systems for different castings and on this basis plotting of suitable diagrams.

14907* (Polish.) On the Flowability of Molding Sands. **Zagadnienia płynności mas formierskich.** L. Lewandowski. *Przeglad Odlewnictwa*, v. 8, no. 7, July 1958, p. 201-204.

A review of the most important methods of determination and the criteria of evaluation of the flowability of molding sands. The importance of the flowability of molding sand in the molding process, and the influence of flowability and other principal factors or the smoothness and the degree of mold density.

14908* (Polish.) Production of Nodular Iron Castings in Sweden. **Żeliwo sferoidalne w Szwecji.** Mieczysław Pachowski. *Przeglad Odlewnictwa*, v. 8, no. 7, July 1958, p. 204-208.

Two methods of production of nodular iron castings most applied in Swedish foundries. One method is based on modification of Ni-Mg alloys, the other on addition of high-Mg alloy into ladle. Characteristic properties and composition of listed types of nodular iron castings and their application.

14909* (Czech.) Molding and Core Mixtures With Bitumen Additions. **Formovací a jádrové směsi s přísadou bitumenů.** Vlastislav Otáhal. *Slévárenství*, v. 6, no. 6, June 1958, p. 177-186.

Tests were carried out with addition of bitumens in molding mixtures. The hard coal pitch was the most suitable. With bitumen additions, drying time of medium size molds was reduced 50% and that of heavy molds 30%. Consumption of new sands was decreased. The casting surface was better and the number of wasters caused by molding mixtures was reduced.

14910* (Czech.) Dark Spots on the Surface of Mild Cast Iron Rolls. **Tmavé skvrny na povrchu měkkých litinových válců.** Robert Kamenský and Lubomir Toman. *Slévárenství*, v. 6, no. 7, July 1958, p. 210-214.

By chemical and mechanical analysis, the authors showed that dark spots on the surface of large mild cast iron rolls are caused by segregations. By statistic studies it was found that the formation of segregations is enhanced by the low C content in cast iron, by its low degree of saturation, and by overheating of the bath in the furnace resulting in gasification of the metal. To remove defects, increase the cooling effect of the mold by decreasing coating thickness and increasing chill weight; limit the gasification of cast iron and carry out the melt under an appropriate slag without unnecessary overheating.

14911* (Czech.) Foundry Technology of Cast Steel Mn-Cr-(Ti) 17/7. **Slévárenská technologie oceli Mn-Cr-(Ti) 17/7 na odlitky.** Alois Šustek. *Slévárenství*, v. 6, no. 7, July 1958, p. 214-217.

The melting method of this steel destined for armatures working under high temperatures and pressures is described. Pouring temperature should be at least 1520 C, measured optically without correction. Gating and feeding is described. Castings were tested in a high-pressure tester at 350 C and 140 atm. pressure. The results were satisfactory.

14912* (Czech.) Casting of Permanent Magnets in Green Molds and in Dried Cores. **Lití permanentních magnetů do syrových forem a do sušených jader.** Jan Rous. *Slévárenství*, v. 6, no. 7, July 1958, p. 218-222.

The technology of casting magnets in green molds and dried cores is compared and advantages of pouring castings of small piece weight in dried thin-walled cores are indicated: decrease of material consumption, decrease of loss due to higher yield of metal, decrease of wasters, decrease of machining allowances, decrease of molders' effort, increase of molding and pouring areas, and decrease of metal losses by splashing.

14913* (Czech.) External Chills Increase Gray Iron Castings Quality and Economy. **Vnější chladítka zvyšují jakost a hospodárnost u odlitků ze šedé litiny.** Karel Hanák. *Slévárenství*, v. 6, no. 7, July 1958, p. 222-225.

The replacement of sand cores with cast iron cores in the hubs of gray iron castings leads to an improvement of the mechanical properties and the elimination of rejects caused by shrinkage; also the work load is lightened.

See also: **14494** (Russian casting plant); **14608** (market for Ti castings); **14821** (nodular iron); **14914** (vacuum heat treating); **15052** (quality control of nonferrous castings).

METALS—HEAT TREATMENT

14914 Vacuum Melting and Heat Treating. II. Vacuum Heat Treating. Roger R. Giler. *Industrial Heating*, v. 25, Aug. 1958, p. 1516 + 8 pages.

Review of the main characteristics of vacuum heat treating. (To be continued.)

14915 Sheet Aluminum Parts for Missiles Heat Treated in Large Salt Bath. *Industrial Heating*, v. 25, Aug. 1958, p. 1552 + 1 page.

A new salt bath furnace has been put into operation to heat-treat sheet Al parts for the F8U Crusader Navy fighters and Regulus guided missiles.

14916 Combination Gas-Electric Tower Furnace Used for Continuous Annealing of Tin Plate (at Y. S. & T.'s Indiana Harbor Works). *Industrial Heating*, v. 25, Aug. 1958, p. 1574 + 1 page.

14917 How to Harden Steel Rolls. C. J. McCormick. *Iron Age*, v. 182, no. 9, Aug. 28, 1958, p. 60-62.

Close control of production gives rolls the ability to withstand extremely rugged service.

14918 Surface Hardening of Titanium in Fused Borax. A. N. Minkevich and Yu. N. Shul'ga. *Metal Industry*, v. 93, July 25, 1958, p. 67-69.

(Translated from the Russian.) This article describes an investigation, carried out by Russian workers, into the effect of chemical heat-treatments in fused borax and in metallic B powder on the wear resistance of Ti.

14919 A Versatile Vacuum Furnace. B. L. Molander. *Metal Treating*, v. 9, no. 4, July-Aug. 1958, p. 2-3.

This 40-ft. by 78-in. dia. furnace can operate up to 2150 F. It is used to treat Ti and Zr.

14920 Heat Treatment of MST 6A1-4V Titanium Alloy. S. R. Seagle, G. W. Bauer, and D. Evers. *Metal Treating*, v. 9, no. 4, July-Aug. 1958, p. 4 + 2 pages.

14921 Use of Gas in Heat Treating Operations at Chrysler. Robert E. Morken. *Metal Treating*, v. 9, no. 4, July-Aug. 1958, p. 8 + 5 pages.

14922* Sub-Zero Quench Aids Aluminium Forming. R. T. Delaney. *Metalworking Production*, v. 102, no. 32, Aug. 8, 1958, p. 1384-1385.

Problems arising during forging, bending, and stretching operations on solution heat-treated Al alloys as a result of spontaneous or age-hardening can be circumvented by maintaining the material at a very low temperature (zero F) until all such operations are completed.

14923* (Russian.) Kinetics of Isothermal Conversion of Austenite Carbon Steel During Induction Heating. **Kinetika izotermicheskogo prevrashcheniia austenita uglerodistoĭ stali pri induktsionnom nagreve.** I. N. Kidin and Iu. A. Bashnin. *Metallovedenie i Obrabotka Metallov*, 1958, no. 7, July, p. 10-15.

The austenite of the types of steel investigated possesses less stability with induction heating than with usual heating owing to less homogeneity of the C and to the size reduction of the grain of austenite.

14924* (Russian.) Accelerated Aging of "EI437B" Heat-Resisting Nickel Alloy Under the Effect of Ultrasonics. **Uskorennoe starenie zharoprochnogo nikelevogo splava EI437B pod vozdeĭstviem ul'trazvuka.** V. S. Ermakov and E. A. Al'ftan. *Metallovedenie i Obrabotka Metallov*, 1958, no. 7, July, p. 22-27.

Ultrasonic vibrations of a frequency of 20 to 26 kc. accelerate aging of this steel. Doubling the energy of the ultrasound increase this effect so that the aging time can be shortened 40 to 50 times.

14925* (Russian.) Effect of Heat Treatment on the Sensitivity to Cuts on Chrome-Molybdenum Steel. **Vliianie termoobrabotki na chuvstvitel'nost' k nadrezu khromomolibdenovanadievoĭ stali.** Z. N. Petropavlovskaia. *Metallovedenie i Obrabotka Metallov*, 1958, no. 7, July, p. 56-58.

The thermal treatment of two types of this steel has a marked effect on the sensitivity to cuts during the endurance test. A choice in the conditions of the thermal treatment can decrease this sensitiveness and retard the embrittlement of this steel. For steel with 1.5-2.5% Cr, 0.5-1% Mo, and 0.2-0.5% V under suitable thermal treatment conditions, there is a double normalization carried on at high temperature (1040 C) and then at low temperature (960 C), with subsequent high tempering at 680 C.

14926 The Pack Carburising and Annealing of 4¼% Ni-Cr-Mo Case Hardening Steel. I. C. Dawes. *Metallurgia*, v. 58, July 1958, p. 3-9.

Various compounds have been used to carburize a 4¼% Ni-Cr-Mo steel, and the influence of these on the "as quenched" hardness, microstructure, carbon content, and annealing characteristic of the carburized case is described. Recommendations are made for a carburizing compound which will prevent the formation of heavy carbide networks and for a standard annealing treatment.

14927* (Italian.) The Carbonitriding Process. **Il processo di carbonitrurazione.** G. Limentani. *Metallurgia Italiana*, v. 50, no. 5, May 1958, p. 191-195.

After mentioning the tempering treatment of carbonitrided steels and the different behavior of these steels in respect of the carburized steel, a new automatic carbonitriding furnace is illustrated.

14928* (Polish.) Sulfurization as a Newest Treatment of Friction Surfaces. **Nasiarczanie jako nowoczesna obróbka powierzchni pracujących na ścieranie.** S. Korcyl and J. Rutkowski. *Przeglad Odlewnictwa*, v. 8, no. 7, July 1958, p. 194-200.

A review of publications on surface S pick-up which is considered as a thermochemical process of heat-treatment in production of machine parts exposed during service to friction. The results of industrial investigations, indicating a considerable improvement of the resistance to friction of the surface exposed to the sulfurization process.

14929 High Temperature Carburizing Is Practical. *Steel* v. 143, Aug. 4, 1958, p. 98-100.

Furnace temperatures up to 2000 F are feasible for 4615 and 9315 Ni alloy steels.

14930* Cold Treatment of Stainless Steel Improves Properties. J. F. Baisch and C. E. Hover, Jr. *Tool Engineer*, v. 41, no. 2, Aug. 1958, p. 87-88.

A subzero cycle for martensite transformation shows promise for reducing notch sensitivity of 17-7PH stainless steel.

14931 The Effect of Heat Treatment on the Corrosion Resistance of Zircaloy-2 and Zircaloy-3. J. G. Goodwin. *U. S. Atomic Energy Commission, WAPD-BT-6*, Jan. 1958, p. 39-47. (UF767 Un3.1wb Contin.)

Typical photomicrographs are presented to illustrate the results of this study.

METALS—MECHANICAL AND PHYSICAL PROPERTIES

14932* (Russian.) Relationship Between the Thermal Conductivity and the Temperature of Selenium Containing Small Chlorine Impurity. **O temperaturnoi zavisimosti teploprovodnosti selena s primes'iu khlora.** G. M. Aliev and G. B. Abdullaev. *Akademiia Nauk SSSR, Doklady*, v. 120, no. 1, May-June 1958, p. 76-78.

The change of heat conductivity is conditioned by the degree of crystallization, content of impurities, and distribution of phonons.

14933 (German.) Damping Investigations of a Steel With 12% Cr and 1% Mo. **Rückdehnungsuntersuchugen an einem Stahl mit 12% Cr und 1% Mo.** Karl Bungardt, Martin Bauser. and Heribert Svchrovsky. *Archiv für das Eisenhüttenwesen*, v. 29, no. 7, July 1958, p. 415-422.

Damping and creep properties in hardened and tempered, and soft annealed states.

14934 The Propagation of Cracks and the Energy of Elastic Deformation. H. F. Bueckner. *ASME, Transactions*, v. 80, no. 6, Aug. 1958, p. 1225-1230.

Reviews crack extension energy and strain energy on a 3-dimensional basis, and shows explicitly the applicability of classic theorems by Betti and Clapeyron. One of the results is that the energy supplied for crack extension equals the strain energy of the difference of the two stress fields before and after crack extension.

14935* On the Galvanomagnetic, Thermomagnetic, and Thermoelectric Effects in Isotropic Metals and Semiconductors. E. J. Moore. *Australian Journal of Physics*, v. 2, no. 2, June 1958, p. 235-254.

General expressions are obtained for effects involving time-independent electric fields, magnetic fields, and thermal gradients. Analytic formulas are given for the isothermal galvanomagnetic effects when a H.F. electric field is applied together with a time-independent magnetic field.

14936 New Techniques for the Study of Bitter Figures. D. J. Craik and P. M. Griffiths. *British Journal of Applied Physics*, v. 9, July 1958, p. 279-282 + 2 plates.

New techniques by optical and electron microscopy.

14937 A photoelastic Technique for Strain Measurement on Flat Aluminium Alloy Surfaces. H. Fessler and D. J. Haines. *British Journal of Applied Physics*, v. 9, July 1958, p. 282-287 + 2 plates.

A technique is described for bonding layers of an epoxy resin on flat Al alloy surfaces. Joints which withstood more than 4% strain were obtained by carefully controlled preparation of the metal and the adhesive. Initial birefringence was avoided by curing the joint without external pressure and by slow cooling after finish curing at 65 C.

14938 Pulsating Pressure Fatigue Tests on Pressure Vessel Branch Connections. P. H. R. Lane. *British Welding Journal*, v. 5, July 1958, p. 327-332.

Compares four different welding details used for attaching branches to the shells.

14939 The Electrical Conductivity of Manganese Arsenide and Antimonide. Gaston Fischer and W. B. Pearson. *Canadian Journal of Physics*, v. 36, Aug. 1958, p. 1010-1016.

Above are reported as part of a program of relating the electronic and crystal structure of compounds to their electrical properties.

14940* Creep Under Changing Complex Stress Systems. I. A. E. Johnson, J. Henderson, and V. Mathur. *Engineer*, v. 206, Aug. 8, 1958, p. 209-216.

The present work has determined the creep rate-complex stress-time relations for a 0.2% carbon steel at 450 C, an Al alloy RR59 at 150 and 200 C, and a Mg alloy (2% Al) at 20 and 50 C. (To be continued.)

14941 Mechanical Properties of Permanent Molded No. 13 Alloy. Donald Peckner. *Foundry*, v. 86, Sept. 1958, p. 86-87.

An investigation to determine mechanical properties of Number 13 Al alloy as cast in permanent molds.

14942* (Czech.) Properties of Wrought and Cast Carbon and Alloy Steels at Low- and Very Low Temperatures. **Vlastnosti uhlíkových a slitinových ocelí tvářených a ocelové litiny za nízkých a velmi nízkých teplot.** Jaroslav Dobrý. *Hutník (Czech)*, v. 8, no. 6, June 1958, p. 194-198.

Effect of low and very low temperature on tensile strength, yield strength, elongation, reduction of area and notch toughness mentioned steels. Effect of metallurgical factors such as purity of metal, deoxidation, and Al addition on decrease of critical temperature of transition to a brittle behavior at low and very low temperatures. Significance of impact test at low temperatures.

14943* (Czech.) Theoretical Principles in Metal Shaping. **Teoretické základy tváření kovů.** Antonín Vach. *Hutník (Czech)*, v. 8, no. 6, June 1958, p. 203-206.

Deformation of monocrystals. Study of plastic, sliding, and diffusion deformations. Basic laws of plastic deformations. Problems of strengthening and recrystallization, resistance to deformation, distribution and magnitude of main stresses, and forging.

14944 A New Approach to the Problem of Creep. J. Glen. *Iron and Steel Institute, Journal*, v. 189, pt. 4, Aug. 1958, p. 333-343.

Effects of a particular alloying element can be detected in the creep curves of various steels and other alloys. These take the form of a sudden deceleration of creep rate over an interval of time and have been called transitions in creep rate.

14945 On Asperity Distributions of Metallic Surfaces. F. F. Ling. *Journal of Applied Physics*, v. 29, Aug. 1958, p. 1168-1174.

A distribution of surface asperities is proposed for the case in which both mating surfaces are rough and asperities are in the form of right circular cones. The essential finding is that the load-compliance characteristics for mating surfaces having comparable roughness have slopes much steeper than those predictable by previous theories, all of which involve the assumption that one of the surface is smooth and rigid.

14946 Work Function and Sorption Properties of Silicon Crystals. J. A. Dillon, Jr. and H. E. Farnsworth. *Journal of Applied Physics*, v. 29, Aug. 1958, p. 1195-1202.

Work functions were obtained by measuring the contact potential differences between the crystals and a Au reference whose work function was measured by the Fowler method. The measurements were carried out in high vacuum ($p < 10^{-9}$ mm. Hg). For nonfloating-zone Si, the work function was higher for samples which were radiation quenched from 900 C than it was for samples which were annealed at 500 C. This effect was not observed for floating-zone material and was presumably a function of occluded O.

14947 Investigation of Low-Temperature Internal Friction. Hollis L. Caswell. *Journal of Applied Physics*, v. 29, Aug. 1958, p. 1210-1214.

The internal friction in pure Cu, in Cu doped with Ni and Au, and in Mg subjected to various amounts of cold work was measured at 40 kc. from 4 to 300 K. Cold work produces a Bordoni relaxation peak in Cu at approximately 80 K. The peak position is independent of the amplitude of vibration for strain amplitudes less than 3×10^{-5}. Suitable annealing reduces and eliminates the peak, as does the presence of relatively large quantities of impurities. Increased cold work and impurity additions also systematically reduce the strain amplitude of the internal friction. A peak was found in cold-working Mg at 20 K and also a small peak in crystalline quartz at 39 K.

14948* An Investigation of Plastic Stress-Strain Relationships Using Grooved Tensile Specimens. J. P. Ellington. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 4, July 1958, p. 276-281.

This method of straining grooved tensile specimens to investigate the plastic behavior of ductile metals was used to find the plastic potentials of thoroughly annealed brass and Cu. The brass was found to have a Mises potential (the strain-rate being proportional to the deviatoric stress), while the Cu showed a deviation from this potential, presumably due to anisotropy.

14949* Grip Effects in the Deformation of Single Crystals. R. L. Fleischer and B. Chalmers. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 4, July 1958, p. 307-313.

The average shear stresses caused by the reaction with the grips during a tensile test of a single crystal are calculated.

14950* Fracture Mechanism of Semi-Brittle Steels in Torsion. J. B. Hunt. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 4, July 1958, p. 321-326 + 1 plate.

The petal-shaped pattern noticed on the fracture surface of certain mild steels in a type of fracture hitherto assumed to be a conventional shear separation. It was found that the fracture sequence involves both tensile failure and sliding in shear.

14951 Cube Oriented Magnetic Sheet. A Major Advance in Magnetic Materials. G. W. Wiener and Klaus Detert. *Journal of Metals*, v. 10, Aug. 1958, p. 507-508.

The nature and uses of the new material, Cubex, developed by Westinghouse.

14952 Magnetic Properties of Cube Textured Transformer Sheet. J. L. Walter, et al. *Journal of Metals*, v. 10, Aug. 1958, p. 509-511.

Magnetic properties of the above, developed by General Electric.

14953* Raising the Physicals of 6063 Alloy Extrusion Billet. James K. McLaughlin. *Modern Metals*, v. 14, no. 6, July 1958, p. 56 + 3 pages.

Probes factors affecting some physical properties of 6063 Al alloy; reveals partial homogenization achieved with induction heating.

14954 Thermal Expansion of Lead at Low Temperatures. P. N. Dheer and S. L. Surange. *Philosophical Magazine*, v. 3, no. 31, July 1958, p. 665-674.

Changes of length of a Pb rod were measured between 4.2 and 10 K by a heterodyne-beat method.

14955 Formation of Fatigue Cracks. W. A. Wood. *Philosophical Magazine*, v. 3, no. 31, July 1958, p. 692-699 + 7 plates.

Observations support the view that fatigue cracking is primarily a simple geometrical consequence of to-and-fro fine slip movements in the fatigue slip-bands.

14956 The Effect of Stacking Fault Energy on Low Temperature Creep in Pure Metals. P. R. Thornton and P. B. Hirsch. *Philosophical Magazine*, v. 3, no. 31, July 1958, p. 738-761.

14957 Superconducting Transition in Aluminum. John F. Cochran and D. E. Mapother. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 132-142.

Further results on the superconducting properties of Al are given which supplement those previously reported. The critical field curve for pure Al was measured by using a paramagnetic salt as a thermometer. The excellent reproducibility of the S-N transition in Al suggests that it may serve as a useful secondary thermometric standard near 1 K.

14958 Magnetization Mechanism and Domain Structure of Multidomain Particles. Henri Amar. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 149-153.

The free energy of a two-domain cube of Fe is considered with and without an applied magnetic field. It is shown that the two-domain configuration may exist only beyond a certain critical size (200 A), that the wall characteristics are size dependent and that their values are substantially different from the values assumed in bulk material. Moreover, magnetization by wall motion is shown to be a "hard process".

14959* (English.) **On the Electrical Properties of Polycrystalline Boron.** Ryosei Uno. *Physical Society of Japan, Journal*, v. 13, July 1958, p. 667-675.

Using several specimens of polycrystalline B, evidence was obtained showing that the conductivity at room temperature may not increase with the amount of impurities, but depends rather on the difference in the crystal structure. Assuming a simple model, carrier concentration and mobility were estimated from the data of conductivity and thermoelectric power. The result was that the carrier concentration may be nearly constant over the range from 100 to 1000 K and that the mobility may vary exponentially with the reciprocal of absolute temperature.

14960* (English.) **The Effect of Tension on the Magnetostriction of Iron Single Crystals.** Hideo Takaki and Junichi Hayashi. *Physical Society of Japan, Journal*, v. 13, July 1958, p. 703-709.

Under various tensions the magnetostriction of Fe single crystals was measured at room temperature by means of strain gage technique. Magnetostriction constants were found to be independent of tension. It was observed that magnetostriction of a rod specimen must be measured only in its uniformly magnetized portion.

14961 Heat Conduction in Bismuth Telluride. H. J. Goldsmid. *Physical Society, Proceedings*, v. 72, July 1958, p. 17-26.

The Lorenz number of the semiconductor Bi_2Te_3 has been evaluated, for the range of partial degeneracy, from data provided by the measurements of electrical conductivity and thermoelectric power. The calculated electronic component of the thermal conductivity, for p-type material, has been found to agree with the experimental results, assuming the lattice thermal conductivity to be independent of the electrical conductivity.

14962 Yield Phenomena in Copper-Arsenic Alloys. K. Schröder. *Physical Society, Proceedings*, v. 72, July 1958, p. 33-41.

The ooccurrence of strain aging in single crystals of arsenical Cu (0.36% As) has been established by simultaneous determinations of stress-strain curves and changes in electrical resistivity. The change in resistance during yielding is explained in terms of Cottrell's model of an impurity atmosphere around dislocations.

14963* (Czech.) Structure and Mechanical Properties of Deep Drawn Zinc Strips. **Struktura i własności mechaniczne cynkowych taśm głębokotłocznych.** S. Socha. *Prace Instytutów Hutniczych*, 1958, no. 3, p. 171-179.

To obtain good workability and homogeneous structure of strips, trials of rolling in various conditions were made on electrolytic and refined metallurgical Zn.

14964* (French.) Rheological Aspect of Hardness. **Aspect rhéologique de la dureté.** A. Braun. *Revue de Métallurgie*, v. 55, no. 5, May 1958, p. 470-474.

Three categories of the properties of solids are distinguishable: elasticity, plasticity, and viscosity. Analysis of the behavior of local deformations set up by stresses to which the solid offers a resistance, which is designated hardness, shows the necessity of defining hardnesses related to the three categories mentioned above. Their significance flows from their relation with the respective constants of elastic, plastic, or viscous matter, a relation which the author calls "hardness function" and which shows also whether these hardnesses are dependent on experimental conditions. This conception of specific hardness allows one to envisage a more detailed analysis of the various rheological properties of a solid, by means of appropriate hardness measurements and by making use of rheological models.

14965* (Italian.) Dependence of Elastic and Anelastic Parameters Upon Composition of the Antimony-Bismuth Alloys. **Dipendenza dei parametri elastici ed anelastici dalla concentarzione nelle leghe antimonio-bismuto.** Kamal Matta and Italo Barducci. *Ricerca Scientifica*, v. 28, no. 3, Mar. 1958, p. 533-540.

Test data and related results are compared with those of a similar research on Ag-Au alloys.

14966* (Czech.) Effect of Alloying Manganese, Chromium and Nickel on the Mechanical Properties of Spheroidal Cast Iron. **Vliv legování manganem, chromem a niklem na mechanické vlastnosti tvárné litiny.** Čestmír Hloušek. *Slévárenství*, v. 6, no. 6; *Prace Československého Výzkumu Slévárenského*, v. 5, no. 7, June 1958, p. 41-50.

Effect of Mn, Ni, and Cr on the mechanical properties and structure of low-alloyed differently heat-treated spheroidal cast iron was studied. The amount of Mn was within the range of 0.52 to 2.42%, Ni 0.3 to 2.86%, and Cr 0.08 to 1.36%. The highest tension strength and yield point was attained in the low-alloyed Mn spheroidal cast iron (as-cast) with the Mn content of 1.6 to 1.7% and in the low alloyed Cr cast iron with the Cr content of 0.7%. In the low-alloyed Ni spheroidal cast iron the tension strength increases slowly and it reaches the highest value with the content of 2.86% Ni. The yield point increases with the increasing content of Ni.

14967* (German.) Creep and Tension Loss of Steel Wire, Particularly at Slightly Elevated Temperatures. **Kriechen und Spannungsverlust bei Stahldraht, insbesondere bei leicht erhöhten Temperaturen.** Werner Papsdorf and Fritz Schwier. *Stahl und Eisen*, v. 78, no. 14, July 10, 1958, p. 937-947.

Methods of carrying out creep tests. Findings gained up to the present concerning creep and tension loss of steel wire. Results of creep tests at different temperatures. Changes in the physical properties after creep tests.

14968* (Romanian.) Criterion to Determine the Zone of Maximum Specific Pressure During the Rolling of Metals. **Asupra unui criteriu pentru determinarea zonei de presiune specifică maximă la laminarea metalelor.** I. Mitrică. *Studii și Cercetări di Mecanică Aplicată*, v. 9, no. 1, 1958, p. 215-227.

The zone of pressure was studied during longitudinal rolling of metal with the two motor driven rolling mills in the case of rolling without drawing. A formula was drawn based on the plastic displacement of the material on either side of the neutral zone. Coefficient of friction of Tzelicov's equations.

14969 Symposium on Large Fatigue Testing Machines and Their Results. 151 pp. 1958. American Society for Testing Materials, Philadelphia. (TA413 Am35s)

Nine papers represent the aircraft, electrical, marine, railroad, and earth removal industries.

14970 A Unique Machine for Large Scale Fatigue Testing. H. V. Cordiano. Paper from "Symposium on Large Fatigue Testing Machines and Their Results". p. 3-20, 1958. American Society for Testing Materials. (TA413 Am35s)

This paper describes a large scale fatigue testing machine of the vibratory type.

14971 Torsional Fatigue Testing of Axle Shafts. E. J. Eckert. Paper from "Symposium on Large Fatigue Testing Machines and Their Results". p. 21-36, 1958. American Society for Testing Materials. (TA413 Am35s)

Unidirectional torsional fatigue tests were run in the low cycle range on axle shafts with an average shank diameter of 3-in. A hydraulic, nonrotating, constant load fatigue machine was built for this purpose.

14972 Fatigue Testing of Airframe Structural Components. H. W. Foster. Paper from "Symposium on Large Fatigue Testing Machines and Their Results". p. 37-58, 1958. American Society for Testing Materials. (TA413 Am35s)

A brief discussion is presented of some important points to be considered in laying out simulated service fatigue tests of components.

14973 Fatigue Performance of Marine Shafting—Laboratory and Service Tests. T. W. Bunyan. Paper from "Symposium on Large Fatigue Testing Machines and Their Results". p. 59-80, 1958. American Society for Testing Materials, Philadelphia. (TA413 Am35s)

14974 Fretting Corrosion of Large Shafts as Influenced by Surface Treatments. Oscar J. Horger and H. R. Neifert. Paper from "Symposium on Large Fatigue Testing Machines and Their Results". p. 81-95, 1958. American Society for Testing Materials, Philadelphia. (TA413 Am35s)

Rotating-bending fatigue tests were made on 7-9/16 in. diameter normalized-and-tempered 0.50% plain carbon steel shaft forgings having a pressfitted outer disk member. Information is presented on the actual surface rolling of about 27-in. diameter marine propeller shafting.

14975 Fatigue Tests of Large Alloy Steel Shafts. F. C. Eaton. Paper from "Symposium on Large Fatigue Testing Machines and Their Results". p. 96-106, 1958. American Society for Testing Materials, Philadelphia. (TA413 Am35s)

Fatigue tests are being made on 9-in. diameter unnotched shafts and 8½-in. diameter notched shafts. This paper is a progress report on work accomplished to date.

14976 Influence of Operating Experience and Full Scale Tests on Propulsion Shafting Design of U. S. Navy Ships. Rudolph Michel. Paper from "Symposium on Large Fatigue Testing Machines and Their Results". p. 107-131, 1958. American Society for Testing aMterials, Philadelphia. (TA413 Am35s)

Reviews operating experiences and full scale tests of propulsion shafting of U. S. Navy ships and changes in design resulting therefrom. A period of approximately 25 yrs. is covered.

14977 Sudden Fracture of Machine Parts and Structure Elements. G. V. Uzhik, M. J. Galperin, and A. A. Zooykova. Paper from "Symposium on Large Fatigue Testing Machines and Their Results". p. 132-141, 1958. American Society for Testing Materials, Philadelphia. (TA413 Am35s)

Transition of fatigue failure to sudden brittle fracture.

14978 Determination of Dynamic Loading in Full Size Fatigue Tests and Some Results. S. V. Serensen and M. E. Garf. Paper from "Symposium on Large Fatigue Testing Machines and Their Results". p. 142-151, 1958. American Society for Testing Materials, Philadelphia. (TA413 Am35s)

14979 Determination of the Mechanical Properties of a High Purity Lead and a 0.058% Copper-Lead Alloy. Thomas E. Tietz. *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 57-695, Apr. 1958, 37 pp. (TL507 Un3.18w Vis.)

The mechanical properties of a high purity Pb and a 0.058% Cu-Pb alloy were determined at test temperatures of 100, 175, 250, and 325 F. Stress-creep time curves were obtained for total strain values of 0.2, 0.5, 1.0, and 2.0% for creep times of from 1 hr. to 500 hrs. The data obtained are summarized in graphical and tabular form.

14980 Some Effects of Cold Rolling, Annealing and Aging on the Mechanical Properties of Zircaloy-3b. D. E. Johnson. *U. S. Atomic Energy Commission, HW*-53621, Nov. 15, 1957, 57 pp. (UF767 Un3.1hw Contin.)

From a practical standpoint, no significant increase in the tensile strength or yield strength of Zircaloy-3b can be obtained by cold-working the material beyond 40% reduction of area. The tensile test properties (uniform strain, necking strain, gage length elongation, and reduction of area) do not reliably indicate the formability limit of Zircaloy-3b relative to that of Zircaloy-2.

14981 The Effect of Copper, Nickel, Iron, and Chromium on the Tensile Properties of Preferentially Oriented Beryllium Sheet. F. M. Yans, A. D. Donaldson, and A. R. Kaufmann. *U. S. Atomic Energy Commission, NMI*-1192, Feb. 14, 1958, 41 pp. (UF767 Un3.1nm Contin.)

Beryllium was mixed with Cu, Ni, Fe, and Cr in powder form, then extruded and cross rolled. In solid solution, small amounts of Fe and Ni had an embrittling effect, while Cu in solution increased the strength, but had no effect on ductility.

14982 Metallurgical Design and Properties of Silver-Indium-Cadmium Alloys for PWR Control Rods. I. Cohen, E. F. Losco, and J. D. Eichenberg. *U. S. Atomic Energy Commission, WAPD-BT-6*, Jan. 1958, p. 1-21. (UF767 Un3.1wb Contin.)

The Ag-15 w/o In-5 w/o Cd alloy, which is comparable to Hf in neutron absorption characteristics, has remarkably high corrosion resistance permitting its use in pressurized water operation without protective cladding. Physical and mechanical properties of this alloy are described, and properties of full-size Ag-15 w/o In-5 w/o Cd PWR-type control rods are discussed.

14983 Solubility of Enriched Boron and Boron Compounds. E. S. Byron, J. F. Thompson, and S. W. Porembka. *U. S. Atomic Energy Commission, WAPD-BT-6*, Jan. 1958, p. 22-25. (UF767 Un3.1wb Contin.)

A brief study was undertaken to determine the relative solubility behavior of B and some of the more widely used compounds. The results of this study are presented along with the reactions involved.

14984 Interim Report on Creep Behavior of Zircaloy-2 and -3. W. D. McMullen. *U. S. Atomic Energy Commission, WAPD-TM-132*, Apr. 1958, 20 pp. (UF767 Un3.1wa Contin.)

Four different material conditions were studied from 200 C to 400 C. Zircaloy-2 was found to have much better creep properties than Zircaloy-3 even though their tensile properties are quite similar. The difference was magnified at lower second stage creep rates and/or higher temperatures. Creep of Zr and the zircaloys tends to follow theoretical high temperature creep behavior in agreement with the temperature dependence of other mechanical properties of Zr.

14985 Compressive Strength and Creep of 17-7 PH Stainless-Steel Plates at Elevated Temperatures. Bland A. Stein. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4296, July 1958, 33 pp. (TL570 Un3t Vis.)

Compressive strength test results from room temperature to 1,000 F and compressive creep test results from 700 to 1,000 F are presented for plates of 17-7 PH stainless steel, condition TH 1,050, which were edge-supported in V-groove fixtures. Plate width-thickness ratios range from 15 to 60.

14986 Influence of Heat Treatment on Microstructure and High-Temperature Properties of a Nickel-Base Precipitation-Hardening Alloy. R. F. Decker, John P. Rowe, W. C. Bigelow, and J. W. Freeman. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4329, July 1958, 53 pp. (TL570 Un3t Vis.)

Influence of various heat treatments on the rupture properties and microstructure of a 55Ni-20Cr-15Co-4Mo-3Ti-3Al alloy. Effects of variations in solution treatment, cooling rate after solution treatment, and aging treatment on the stress-rupture properties of the alloy at 1,600 F and 25,000 psi. were measured and related to the variations in the size and distribution of precipitates within the alloy and to residual rolling effects.

14987 The Effect of Atmosphere on Creep-Rupture Properties of a Nickel-Chromium-Aluminum Alloy. P. Shahinian and M. R. Achter. *U. S. Office of Naval Research, NRL Report* 5133, May 6, 1958, 13 pp. (T21 Un3.5n Contin.)

The role of ductility in the effect of environment on creep and rupture properties was investigated employing a 76% Ni, 19% Cr, and 4% Al alloy. Creep-rupture tests were conducted primarily in air and in vacuum at 1300, 1500, and 1900 F. It was found that at low temperatures and high stresses, time-to-rupture was longer in vacuum than in air, but that at high temperatures and low stresses the reverse was true.

14988 The Influence of Ferrite Banding on the Impact Properties of Mild Steel. W. S. Owen, Morris Cohen, and B. L. Averbach. *Welding Journal*, v. 37, Aug. 1958, p. 368s-374s.

Charpy properties of a severely banded ferrite-pearlite structure are compared with those of a random ferrite-pearlite distribution.

14989 Material Rating Based Upon True Stress-Strain Properties. Joseph Marin and M. G. Sharma. *Welding Journal*, v. 37, Aug. 1958, p. 375s-378s.

Interpretations were made based upon data for 56 materials. Results show that the material ratings based upon the nominal and true properties are not the same. This led to the recommendation that, in the future, ratings of materials based upon mechanical properties be determined based upon true stress-strain relations.

See also: **14817** (tensile and magnetic properties of metals used for safety tools); **14826** (influence of composition on properties of Mo, Cr, Fe, Ni base alloys); **15011** (mechanical properties of steel strip); **15012** (properties of wire rope); **15026** (lattice rotation during compression).

METALS—MECHANICAL WORKING

14990 Testing of Machinability by Radioactive Methods. Bertil Colding. *Acta Polytechnica Scandinavica, Mechanical Engineering Series No.* 1, 1958, 73 pp. (T1 Ac81me Vis.)

A large number of machinability tests were carried out on five different work materials using radioactive carbide cutting tools. The tests were made in an ordinary lathe, provided with radiation shield. The wear on the carbide tools was determined by measurement of the radioactivity of the chips cut.

14991* (English.) **Theoretical Investigations Into the Production of Gears by Hot-Rolling.** I. Vörös. *Acta Technica Academiae Scientiarum Hungaricae*, v. 21, nos. 1-2, 1958, p. 47-78.

14992* New Abrasives: New Grinding Techniques. K. McIndoe. *Australasian Engineer*, 1958, June 7, p. 107 + 8 pages.

Cutting theory; grinding wheels; types of surface finish; sharpening and dressing equipment and tools.

14993 Development of the Tungsten-Arc Cutting Process. R. A. Cresswell. *British Welding Journal*, v. 5, Aug. 1958, p. 346-355.

Process utilizes a constricted arc in N or N/H mixtures to produce clean cuts at high speed on materials which include Al and its alloys, stainless steel, and Cu and Cu alloys.

14994 Application of the Numerical Analogue System to Oxygen Cutting Machines. L. J. Hancock and J. R. Arrowsmith. *British Welding Journal*, v. 5, Aug. 1958, p. 369-373.

The control system continuously defines the position of the burner and also operates the flame controls, both functions being coded on a punched paper tape.

14995 The Largest Pressing Facility Yet. *Canadian Metalworking*, v. 21, Aug. 1958, p. 52 + 2 pages.

Huge steel presses now being built are a direct development from the need for vast reactor vessels used for nuclear power.

14996* Helpful Hints for Successful Brazing. Orland Jack. *Carbide Engineering*, v. 10, Aug. 1958, p. 9-12.

Description of the three basic methods usually employed for brazing carbide tips to tool shanks: torch, gas burner, and H.F. induction heating.

14997* Ceramics—A Material for Gages? Carl G. Erickson. *Carbide Engineering*, v. 10, Aug. 1958, p. 13-15.

Ceramics are being applied to regular conventional cylindrical plug and ring gages, thread plug gages, and various wear applications such as anvils for electrolimit comparators.

14998 Development of a High-Speed Indexing Mechanism. Ray C. Johnson. *Machine Design*, v. 30, Sept. 4, 1958, p. 134-138.

Design procedure and details for a unique cam-based intermittent motion unit that can be readily adapted to varying operating requirements.

14999 The Use of a Computer in a Rolling Mill Office. R. G. Massey. *Machinery Lloyd (Overseas Ed.)*, v. 30, no. 14, July 5, 1958, p. 70 + 5 pages.

Equipment, operation, and staff requirements.

15000 The Production of Calculating and Ticket-Issuing Machines. *Machinery (London)*, v. 93, July 9, 1958, p. 60-76.

Pierced blanks produced by a multi-stage tool are bent to a channel section, and slots are pierced in a hand-fed tool, which incorporates banks of horizontally-moving punches.

15001 Some Experiments on the Impact Extrusion of Aluminium, Copper and Steel. D. F. Galloway. *Machinery (London)*, v. 93, Aug. 13, 1958, p. 356-363.

Effects of process variables on extrusion forces and metal flow.

15002 Finishing Operations on the Root Ends of Jet Engine Blades. *Machinery (London)*, v. 93, Aug. 13, 1958, p. 373-376.

Describes a special milling machine which has been developed to automatically remove the feather-edges which remain after broaching or grinding operations.

15003 Lower Costs With No-Draft Forgings. Homer Harvey. *Materials in Design Engineering*, v. 48, Aug. 1958, p. 94-95.

Production of airframe and missile parts as no-draft forgings close to finished dimensions, thus saving material and reducing machining time.

15004* German Developments in Flow-Turning. W. Bosch. *Metalworking Production*, v. 102, no. 29, July 18, 1958, p. 1247-1251.

Equipment for the process is explained.

15005* Automated Bearing Production Boosts Demand. *Metalworking Production*, v. 102, no. 29, July 18, 1958, p. 1254-1255.

An English study of Timken's new installation for railroad axle bearings in Columbus.

15006* Machine Tool Alignment Recorder. C. Timms and T. W. Aitchison. *Metalworking Production*, v. 102, no. 29, July 18, 1958, p. 1262-1266.

Device is capable of making completely autographic tests in the normal cutting zone of the hob with an accuracy of 0.0001 in.

15007* (Russian.) Plasticity of Heat-Resisting Alloys Depending on the Structure and Kind of Stressed State. **Plastichnost' zharoprochnykh splavov v zavisimosti ot struktury i vida napriazhennogo sostoianiia.** M. V. Rastegaev. *Metallovedenie i Obrabotka Metallov*, 1958, no. 7, July, p. 30-35.

The plasticity of difficultly deforming alloys, during deformation at high temperatures and in the presence of tensile stresses, depends basically on the form and character of the distribution of the second phase in the structure formed during heating (or cooling) just when the deformation begins.

15008* (French.) Investigation of the Forging of the Alloy T-C_3Fe. **Étude du forgeage de l'alliage T-C_3Fe.** A. Saulnier and R. Develay. *Revue de Métallurgie*, v. 55, no. 5, May 1958, p. 433-441.

The mechanical properties of forged products in T-C_3Fe (Ti-Cr 2.7%, Fe 1.3%) were determined as a function of the temperature at the start of the first hot working, reduction of thickness during hot working, and the method of taking the specimen. A very clear difference in properties and structure was established according to whether the forging temperature is within the $\alpha+\beta$ field (below 800 C) or in the β field (above 800 C).

15009* (French.) Investigation of the Forging of the Alloy T-A_6V. **Étude du forgeage de l'alliage T-A_6V.** R. Syre and A. Saulnier. *Revue de Métallurgie*, v. 55, no. 5, May 1958, p. 442-447.

To achieve tensile strengths of at least 92 kg. per sq. mm. in forged products in the alloy T-A_6V (Ti-Al 6%, V 4%) with elongations of at least 10% irrespective of the manner of taking the specimens (longitudinal, transverse, or perpendicular to the former) it is necessary to transform the lamellar cast structure into an equiaxed structure. With forging beginning at 950 C, this cannot be achieved unless reductions of thickness of the order of 80% are applied during the final working. The minimum degree of reduction can be lowered to 50% either by reducing the temperature at which forging is begun to about 900 C, or by introducing a swaging pass before the final hot working.

15010* (German.) Study on the Cold Rolling of Steel Having Elevated Carbon Contents With Sorbitic and Pearlitic Structure. **Über das Kaltwalzen von Stählen mit höheren Kohlenstoffgehalten bei sorbitischer und perlitischer Gefügeausbildung.** Wilfried Roth, Hermann Lassek, and Fritz Fischer. *Stahl und Eisen*, v. 78, no. 14, July 10, 1958, p. 948-955.

Cold rolling without process annealing; cold rolling with process annealing followed by heat-treating; heat treating tests.

15011* (German.) Study on the Effect of Different Working Conditions of a Three Stand Cold Rolling Tandem Mill Train on the Mechanical Properties of Steel Strip. **Einfluss unterschiedlicher Arbeitsbedingungen einer dreigerüstigen Kaltwalz-Tandemstrasse auf die mechanischen Eigenschaften von Bandstahl.** Jacques Gerhard Brockhaus, Fritz Fischer, Harald Graetz, and Klaus Ohlwein. *Stahl und Eisen*, v. 78, no. 14, July 10, 1958, p. 955-960.

15012* (German.) Effect of Working Conditions on Mechanical Properties, When Patenting Rope Wires After Electric Resistance Heating. **Einfluss der Arbeitsbedingungen beim Patentieren von Seildrähten nach Widerstandserhitzung auf die Festigkeitseigenschaften.** Werner Lueg and Karl Schemmer. *Stahl und Eisen*, v. 78, no. 14, July 10, 1958, p. 960-965.

Materials and method of carrying out the patenting process. Effect of the quenching temperature and of the throughput rate on the mechanical properties of the patented drawn rope wires. Comparison of the properties obtained with indirect and direct heating before patenting.

15013 (Russian.) Technology of Cold Stamping. **Tekhnologiia kholodnoĭ shtampovki.** A. N. Malov. 575 pp. 1958. Gosudarstvennoe Izdatel'stvo Oboronnoĭ Promyshlennosti, Moscow. (TS253 M29t2)

Well systematized information on preparation of material, stamping, forming, bending, deep drawing (including hydraulic, and with rubber matrices) and other stamping processes, and also their automation and mechanization.

15014* Forming High-Strength Materials. William W. Wood. *Tool Engineer*, v. 41, no. 2, Aug. 1958, p. 63-69.

Three major factors limit the forming of high-strength aircraft materials. They are elongation, buckling, and springback. The author discusses each in turn and shows how they can be overcome by a relatively new process—elevated-temperature creep forming.

See also: **14922** (forming Al at low temperatures).

METALS—METALLOGRAPHY, TRANSFORMATIONS, AND STRUCTURES

15015* (English.) **The Determination by Oxidation of Austenitic Grain Size in Mild Steel.** P. Széki. *Acta Technica Academiae Scientiarum Hungaricae*, v. 21, nos. 1-2, 1958, p. 79-86.

The specimens are heated in industrial N. The small quantity of O in the atmosphere oxidizes, and renders visible the austenitic grains corresponding to the temperature of heating. The coarsening temperature of the austenite grains of an aluminum-killed mild steel, examined by this method, practically coincides with the temperature of AlN dissolution.

15016* (German.) Solubility of Tungsten Carbide in Titanium Carbide. **Über die Löslichkeit von Wolframkarbid in Titankarbid.** Josef Hinnüber and Willy Kinna. *Archiv für das Eisenhüttenwesen*, v. 29, no. 6, June 1958, p. 391-396.

Dependence of lattice constants on C content. Mixed crystals of W and Ti carbides. Effect of Co content on solubility. Interpretation of the production of inhomogeneities in mixed crystals of hard metal alloys.

15017 (German.) The Cubic Arrangement of Recrystallization Texture in Iron-Silicon Alloys. **Die Würfellage als Rekristallisationstextur bei Eisen-Silizium-Legierungen.** Hans-Eberhard Möbius and Franz Pawlek. *Archiv für das Eisenhüttenwesen*, v. 29, no. 7, July 1958, p. 423-432.

Determining textures by means of refined evaluation of torsional moment measurements. Production of a perfect cubic arrangement in secondary recrystallization of Fe-Si alloys. Cause of the cubic arrangement. Magnetic properties.

15018 Ageing Characteristics of "As-Deposited" Aluminium Alloy Weld Metal With Particular Reference to Al-Cu-Si and Al-Zn-Mg Alloys. P. T. Houldcroft and F. Fidgeon. *British Welding Journal*, v. 5, July 1958, p. 319-326.

15019* (French.) Conditions of Regeneration of Single Crystals of α-Uranium, With Traces of Impurities, After a Few Hours in the β-Phase. **Sur les conditions de régénération de cristaux uniques d'uranium α, contenant des traces d'impuretés, après un séjour de quelques heures en phase β.** Gérard Donze and René Faivre. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 26, June 30, 1958, p. 3619-3621.

Regeneration by maintaining the nuclei, as in the case of iron. Owing to the anisotropy of expansion of α-uranium, this phenomenon is clearly revealed by the curves of thermodilatometric analysis.

15020* (French.) Superstructure in a 15 Per Cent Ti-Al Alloy. **Surstructure dans un alliage Ti-Al 15%.** Adrien Saulnier and Maurice Croutzeilles. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 26, June 30, 1958, p. 3622-3625.

Diffraction study under the electron microscope of a thin section of the alloy revealed a compact and ordered hexagonal phase with parameters a=5.77 Å and c=4.65 Å, which is a superstructure of the Mg_3Cd type of the solid α-solution.

15021* (French.) Determination of the Coefficients of Diffusion and Study of the Kirkendall Effect in the Uranium-Titanium Pair. **Détermination des coefficients de diffusion et étude de l'effet Kirkendall sur le couple uranium-titane.** Yves Adda and Jean Philibert. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 247, no. 1, July 7, 1958, p. 80-83.

Plotting concentration-penetration curves for the U-Ti diffusion couple between 950 and 1075 C. Coefficient of chemical diffusion as a function of concentration. Quantitative study of the Kirkendall effect and coefficients of intrinsic diffusion of U and Ti.

15022* (French.) Orientation of Superstructure Created by the Mechanical Deformation of a Fe-Ni Alloy. **Surstructures d'orientation eréées par déformation mécanique d'un alliage Fe-Ni.** Robert Vergne. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 247, no. 2, July 16, 1958, p. 197-200.

The ferromagnetic binary alloy chosen had a relatively low Curie point and formed a solid solution near the equiatomic concentration. The magnetizing forces due to tensile treatment did not increase linearly with increase in the tension. Results were compared with Neel theory.

15023 The Diffusion of Hydrogen in Steel at Temperatures of —78° to 200°C. J. D. Hobson. *Iron and Steel Institute, Journal*, v. 189, pt. 4, Aug. 1958, p. 315-321.

Specimens cut from large forgings show that the diffusion of H in steel does not follow the predictions of the accepted exponential equation at temperatures below about 150 C.

15024 Behaviour of Nitrogen in 3% Silicon Iron. R. E. Fryxell, N. Galitzine, and F. S. Gardner. *Iron and Steel Institute, Journal*, v. 189, pt. 4, Aug. 1958, p. 327-332.

15025* (English.) **Some Observations on Deformation Structures in Hand Impact Tools and in Splinters From Such Tools.** Axel Hultgren. *Jernkontorets Annaler*, v. 142, no. 5, 1958, p. 229-245.

Metallographic investigation of steel hand tools and splinters from such tools. Deformation structures show indications of shearing, the heat evolved causing transformation to austenite in a thin layer followed by martensite formation.

15026* Single Crystal Lattice Rotation During Compression. R. L. Fleischer. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 4, July 1958, p. 301-306.

Lattice rotation during compression of a single crystal can be the reverse of that observed in tension rather than the slip-plane rotation previously observed.

15027 Molybdenum Binary Constitutional Diagrams. V. W. Barth, G. W. P. Rengstorff, and H. B. Goodwin, compilers. Paper from "The Metal Molybdenum, Symposium Proceedings". p. 553-571, 1958. American Society for Metals, Cleveland. (TN799.M7 M56)

Summarizes available constitution diagrams for binary Mo alloy systems. Two isothermal sections of the Mo-Cr-Ni ternary system are included. Sixteen diagrams judged to best represent the several systems were selected and are presented.

15028* (Russian.) Graphite Dissolving in Austenite. **O rastvorenii grafita v austenite.** K. P. Bunin and A. A. Baranov. *Metallovedenie i Obrabotka Metallov*, 1958, no. 7, July, p. 15-18.

The closing of the pores formed in austenite during the diffusion of graphite near 1000 C are of a self-diffusion nature. Silicon accelerates the closing of the empty spots in Fe alloys, since its atoms, by causing a deformation of the Fe lattice, increase the coefficient of diffusion.

15029* (Russian.) Investigation of the Dispersability of Ferromagnetic Separations in Austenite Alloys, Using Demagnetization Curves. **Issledovaniia dispersnosti ferromagnitnykh vydelenii v austenitnykh splavakh po krivym razmagnichivaniia.** N. I. Eremin. *Metallovedenie i Obrabotka Metallov*, 1958, no. 7, July, p. 27-30.

Study of demagnetization curves of steel with 18 Cr-8 Ni after plastic deformation by expansion up to 10, 25, and 40%. Changes in the curves after aging the specimens for 2 hrs. at 650 C. Change of the coercive force during aging.

15030* (Russian.) Carbide Separation on Tempering of Alloy Steel. **Vydelenie karbidov pri otpuske legirovannykh staleĭ.** A. V. Stepanov. *Metallovedenie i Obrabotka Metallov*, 1958, no. 7, July, p. 59-61.

The form and sizes of the carbide particles of Mo_2C, VC, TiC, and Cr_7C_3 precipitated during tempering of alloy steel were studied under the electron microscope in the metal and after separation of the carbide particles on "formvarovykh" replicas. Chemical composition and conditions of austenitization. Variation in the hardness of the chilled steel in relation to the tempering temperature for one hr.

15031 Precipitation of Cu in Ge. II. Supersaturation Effects. III. Quench Effects in Nearly Perfect Crystals. A. G. Tweet. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 57-71.

15032 Phase Transition in Solid Mercury. C. A. Swenson. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 82-91.

A polymorphic transition in solid Hg which was initially discovered by Bridgman was studied at lower temperatures and pressures than those previously used. The transition would occur at zero pressure and 79 K if these data are extrapolated. However, the transition begins to show time effects and large pressure hysteresis at much higher temperatures, and below 93 K it can only be made to run irreversibly and in the α-β direction, and then only upon the application of several thousand atm. pressure. The changes in the molar vol. with both temperature and pressure from 4.2 to 200 K and from 0 to 12,000 atm. were determined in addition to the changes in the thermodynamic parameters at the transition.

15033 Analysis of Low-Energy Sputtering. Edwin Langberg. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 91-97.

It is postulated that for low-energy sputtering the interatomic energy and distance relation can be represented by a Morse curve, and that the energy transfer in the lattice proceeds essentially by two-particle (i.e. binary) collisions. Based on these assumptions, a two-collision sputtering mechanism near the threshold is described.

15034 The Martensite Phase Change in Metals. M. A. Jaswon. *Research*, v. 11, Aug. 1958, p. 315-323.

An account of martensite transformations in metals, particularly from the point of view of glide processes.

15035* (French.) Identification and Study of the "Clear Zone" Phenomena in the Structural-Hardening Ni-Cr and Ni-Cr-Mo Alloys. **Identification et étude du phénomène de "zones claires" dans les alliages Ni-Cr et Ni-Cr-Co à durcissement structural.** Ch. Bückle and J. Poulignier. *Revue de Métallurgie*, v. 55, no. 5, May 1958, p. 417-432.

15036* (French.) Radiocrystallographic Investigation of Tempered Martensite Carbides Prepared by Quenching Pure Iron-Carbon Steels. **Étude radiocristallographique des carbures de revenu de la martensite préparée par trempe d'aciers fer-carbone purs.** Fernand Marion and René Faivre. *Revue de Métallurgie*, v. 55, no. 5, May 1958, p. 459-469.

The authors isolated tempered martensite carbides (tempered between 150 and 400 C) by employing electrolytic methods, and then studied them by X-ray diffraction. The martensite was prepared by quenching pure Fe-C steels in brine. The carbides formed by tempering may be considered as a continuous series of non-stoichiometric compounds which approach cementite when the temperature rises or when the duration of isothermal heating is prolonged.

15037* (English.) **Diffusion of Silicon and Manganese in Liquid Iron. I. Diffusion in Liquid Iron Saturated With Carbon.** Tunezô Saitô and Kazuo Maruya. *Tôhoku University, Science Reports of the Research Institutes, Ser. A. Physics, Chemistry, Metallurgy*, v. 10, no. 3, June 1958, p. 259-268.

15038 The Uranium-Nitrogen-Carbon System. Alfred E. Austin and Arnold F. Gerds. *U. S. Atomic Energy Commission, BMI-1272*, June 23, 1958, 18 pp. (UF767 U3b Contin.)

This system was studied at 1800 C under vacuum and under one atm. N pressure. There is complete solid solubility between UN and UC, and essentially no solid solubility of N in UC_2 or U_2C_3 or of carbon in U_2N_3. At 1800 C the two-phase field, U(C,N) and UC_2, and the three-phase field, U(C,N), UC_2, and C, exist in vacuum or argon. At one atm. of N, the U nitrides are more stable than the U carbides up to 1800 C, but at 2000 C, the U carbides UC_2+U(C,N) become more stable. At one atm. of N, U_2N_3 is the stable phase up to 1550 C, and U(N,C) solid solution is stable at 1800 C.

15039 Constitution of Uranium and Thorium Alloys. Frank A. Rough and Arthur A. Bauer. *U. S. Atomic Energy Commission, BMI-1300*, June 2, 1958, 138 pp. (UF767 U3b Contin.)

15040 A Metallographic Examination of Zirconium and Zirconium Alloys. E. L. Richards and E. A. Wright. *U. S. Atomic Energy Commission, WAPD-BT-6*, Jan. 1958, p. 26-38. (UF767 Un3.1wb Contin.)

A series of photomicrographs show structures that are typical of Zr, Zircaloy-2, and Zircaloy-3 ingots and hot-rolled strips.

15041* (Russian.) X-Ray Analysis of Galvanic Iron-Nickel Alloys. **Rentgenostrukturnoe issledovanie gal'vanicheskikh zhelezo-nikelevykh splavov.** N. S. Fedorova. *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 6, June 1958, p. 1211-1213.

Six different compositions were considered. Alloys containing 9 and 18% Ni were found to crystallize in a cubic body-centered lattice; alloys containing 52, 64, and 88% Ni in a face-centered lattice; the alloy with 31% Ni is a mixture of the two phases, body-centered and face-centered cubes. The parameters of the alloy network change, depending upon the composition.

15042* (Russian.) Investigation of the Photomagneto-Electric Effect as a Method to Determine the Volume Length of Diffusion in Germanium. **Issledovanie fotomagnitoelektricheskogo effekta kak metoda opredeleniia ob'emnoĭ dliny diffuzii v germanii.** S. G. Kalashnikov and E. G. Landsberg. *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 7, July 1958, p. 1387-1393.

Effect of surface treatment on the values of length of diffusion obtained by simultaneous measurement of the photomagneto electric effect and the photoconductivity. Comparison of this method with the photoelectric method show agreement in results of both.

See also: **14943** (deformation of monocrystals).

METALS—POWDER

15043 Electrolytic Production of Straight and Alloyed Metal Powders. I. Ljungberg. *Iron and Steel Institute, Journal*, v. 189, pt. 4, Aug. 1958, p. 303-306.

Outlines the methods of electrolytic production of Fe, Ni, and ferro-alloy powders. Suitable electrolytic solutions and anode materials are discussed, and tables show the physical properties of some powders obtained and some alloy sintered steels produced from the powders.

15044 Powder Metallurgy Molybdenum-Base Alloys. Robert I. Jaffee. Paper from "The Metal Molybdenum, Symposium Proceedings". p. 330-364, 1958. American Society for Metals, Cleveland. (TN799.M7 M56)

The best powder metallurgy alloys apparently are those with TiO_2 and ZrO_2 additions. There is an optimum in creep strength of Mo-TiO_2 alloys made by powder metallurgy at about 0.1% TiO_2, whereas in arc-cast alloys the optimum is reported to be close to 0.5% Ti. Although the rupture strengths attainable by powder metallurgy methods using oxide dispersions are of the same order of magnitude as those of the best arc-cast alloys, they are somewhat inferior.

15045 Sintering Method for Semiconductor Material. Gerhart K. Gaulé, James T. Breslin, and John R. Pastore. *Review of Scientific Instruments*, v. 29, July 1958, p. 565-567.

A sintering process was developed which makes it possible to utilize Si or B semiconductor material which comes in the form of small grains or small dendrite-like pieces. When pressure, alternating current, and an R.F. field are applied, this loose material is sintered into rods without using a binder.

15046* (French.) Preparation of Uranium Monocarbide and Its Relation to the Carbides of Refractory Transition Metals. **La préparation du monocarbure d'uranium et son comportement envers les carbures des métaux de transition réfractaires.** H. Nowotny, R. Kieffer, and F. Benesovsky. *Revue de Métallurgie*, v. 55, no. 5, May 1958, p. 453-458.

The monocarbide of U is of interest as a fuel in reactors. Solid solutions with other refractory carbides of groups 4a and 6a of the periodic system are characterized by great stability. The specimens were obtained by sintering under pressure and were examined by means of X-rays. A complete series of solid solutions is found in the UC-ZrC, UC-TaC, and UC-NbC systems. Uranium carbide is also a good solvent for other carbides, particularly for VC, but the solubility of UC in VC is small. Ternary carbide phases, probably isomorphous, are produced in systems containing Cr_3C_2, MO_2C, and WC.

15047 Tooling for Metal Powder Parts. George H. DeGroat. 242 pp. 1958. McGraw-Hill, New York. (TS245 Am35t)

Process planning, tool design, equipment, and operations involved in producing structural parts from metal powders.

See also: **14981** (Be mixed with Cu, Ni, Fe, and Cr in powder form).

NONDESTRUCTIVE TESTING AND QUALITY CONTROL

15048 Inspection, Testing in Modern Welding. H. Thomasson. *Canadian Metalworking*, v. 21, Aug. 1958, p. 20 + 1 page.

Covers destructive and nondestructive testing.

15049* (Russian.) Radiographic Measurement of Residual Stresses in Ceramic Insulators of Sintered Corundum. **Rentgenograficheskie izmereniia ostatochnykh napriazhenii v keramicheskikh izoliatorakh iz plavlennogo korunda.** Jaroslav Feifer. *Czechoslovak Journal of Physics*, v. 8, no. 3, 1958, p. 322-331.

Results of radiographic measurements of the course of residual stresses in an Al_2O_3 insulator. Accuracy of determination of chief stress components. Reproducibility of measured value of stresses.

15050 Slipping-Clutch Fatigue-Testing Machine. N. B. Owen and H. L. Cox. *Engineering*, v. 186, July 18, 1958, p. 84-85.

Construction and operation of a 1500 lb. direct-stress fatigue-testing machine operated by a slipping clutch.

15051* Magnetic Particle Inspection of Structurals. *Industry & Welding*, v. 31, Aug. 1958, p. 32 + 1 page.

California's acceptance of welded structures is based on this inspection method.

15052 Metallurgical Aspects of the Control of Quality in Non-Ferrous Castings. 148 pp. 1957. Institute of Metals, London. (TS233 In7m Over.)

A monograph of eight papers selected from the *Journal of the Institute of Metals*.

15053* Sources of Defects Located by Nondestructive Testing. C. E. Betz. *Nondestructive Testing*, v. 16, no. 4, July-Aug. 1958, p. 319-332.

Article presents a general idea of how many typical and often-encountered defects are produced. Modern nondestructive tests can be used at any point in the manufacturing operation to eliminate defective material. They can become an integral step in production.

15054* Penetrant Testing. Taber de Forest. *Nondestructive Testing*, v. 16, no. 4, July-Aug. 1958, p. 333-337.

Four typical methods in common use are described: water wash fluorescent, Post Emulsification, dye penetrant, and water wash visible methods. The types of flaws which are shown by penetrant methods in general are illustrated.

15055* Principles of High Energy Radiography. Stanley S. Stacey. *Nondestructive Testing*, v. 16, no. 4, July-Aug. 1958, p. 339-344.

Since the quality of a radiograph is related to the energy of the exposing radiation it is important that the basic principles governing this relationship be thoroughly understood. The effects of energy upon scattered radiation, radiographic contrast and image sharpness are discussed and illustrated. In addition, means for exercising control over radiographic quality are reviewed.

15056 Nondestructive Bond Inspection Test by Electric Resistance Measurement for Complete Flat-Plate Fuel Element Subassemblies. C. V. Weaver, W. H. Goldthwaite, S. L. Fawcett, and R. W. Dayton. Paper from "Symposium on Nondestructive Tests in the Field of Nuclear Energy". p. 286-293, 1958. American Society for Testing Materials, Philadelphia. (TA410 Am35snt)

A prototype instrument capable of locating unbonded areas at least as small as 1/16-in. in diameter and possibly as small as 1/32-in. in diameter was designed and built for examining the core-to-clad bonds of complete fuel element subassemblies. Both sides are examined at once and permanent records are produced.

15057 A Technique for Gamma Radiographic Inspection of Parallel-Plate Fuel Assemblies. G. D. Calkins, M. Pobereskin, R. B. Price, and N. M. Ewbank, Jr. Paper from "Symposium on Nondestructive Tests in the Field of Nuclear Energy". p. 382-390, 1958. American Society for Testing Materials, Philadelphia. (TA410 Am35snt)

Using a 0.005-in. diameter W wire, a line radiation source of W^{185} was prepared by neutron activation. Parallel wires mounted in a holder which fits into the coolant channel were used to locate the core alloy edge, necking, and defects in the core for two adjacent fuel plates in a multiplate assembly. Thulium-170 was a more suitable radiation source, but is not obtainable as wire.

15058 A Panoramic Camera for Inspecting Walls of Deep Narrow Slots. G. G. Cocks and C. M. Schwartz. Paper from "Symposium on Nondestructive Tests in the Field of Nuclear Energy". p. 391-395, 1958. American Society for Testing Materials, Philadelphia. (TA410 Am35snt)

Comparison of photographs of the channel walls of a subassembly taken with the panoramic camera and with an 8 in. x 10 in. camera and studio lighting indicates that the panoramic camera shows up lightly corroded areas which do not appear in the other photograph. It is thus evident that the panoramic camera is capable of revealing tonal shades not seen under studio lighting conditions. More intense radiation would permit adequate exposures on color film. It has been demonstrated that the apparatus will work with slots as narrow as 0.050 in.

15059 (German.) Using Radioactive Isotopes to Determine the Origin of Non-Metallic Inclusions in Steel. **Die Anwendung radioaktiver Isotope zur Ermittlung der Herkunft nichtmetallischer Einschlüsse im Stahl.** K. Skuin. *Technik*, v. 13, no. 7, July 1958, p. 489-492.

Description of the Soviet "marked atoms" method to determine the proportion of non-metallic inclusions from furnace or ladle slag. Refractory lining in the casting installation. Limitations of the method to the average slag inclusion contents.

15060* Egg-Crate Inspection System Cuts Rejects. William R. Baker. *Tool Engineer*, v. 41, no. 3, Sept. 1958, p. 83-85.

A quality control system developed by Parker Aircraft provides for early discovery and immediate reporting of error sources, resulting in increased production and fewer rejects. The system is highly effective where low quantities of complex parts are being produced.

See also: **14772** (thickness gage); **15133** (nondestructive testing in nuclear energy).

NUCLEAR PHYSICS, NUCLEONICS, AND RADIATION

15061* Industrial Applications of Radioisotopes. *Air Conditioning, Heating, and Ventilating*, v. 55, Aug. 1958, p. 78.

Cost savings made possible from known applications of radioisotopes and increased production facilities for artificial radioisotopes, particularly Co-60, has increased the number of industrial users from 18 in 1946 to 1,667 in 1956. Current users are listed.

15062* (Russian.) Motions With Homogeneous Deformation in Magnetic Hydrodynamics. **O. dvizheniiakh s odnorodnoĭ deformatsieĭ v magnitnoĭ gidrodinamike.** A. G. Kulikovskiĭ. *Akademiia Nauk SSSR, Doklady*, v. 120, no. 5, June 11, 1958, p. 984-986.

15063* (German.) The Milne Problem in Anisotropic Scattering (Application to Thermal Neutrons). **Das Milnesche Problem bei anisotroper Streuung (Anwendung auf thermische Neutronen).** D. Lyons. *Annalen der Physik*, v. 1, nos. 6-8, 1958, p. 400-423.

The "standard problem" can be solved in a very satisfactory approximation and without special analytical accessories if, at the start, one assumes the anisotropy of the elementary scattering act. The variation of density on the edge of the medium is developed by using exponential integrals.

15064* Determinantal Approach to Meson-Nucleon Scattering. M. Baker. *Annals of Physics*, v. 4, July 1958, p. 271-305.

A treatment of scattering is presented where the construction of the scattering phase shifts is regarded as an energy value problem. Using the relation between the phase shift δ (E) and the energy shift $\triangle$ E, the phases can be obtained directly from an infinite determinant.

15065* A Wave Equation for a Particle of Maximum Spin One. Herman Feshbach and William Nichols. *Annals of Physics*, v. 4, Aug. 1958, p. 448-458.

A general, first-order, linear, relativistic wave equation for a particle of arbitrary half-integral maximum spin is presented.

15066* (English.) **Energy Levels in Bi^{207} From the Decay of Po^{207}.** E. Arbman, J. Burde, and T. R. Gerholm. *Arkiv för Fysik*, v. 13, no. 6, 1958, p. 501-538.

Two positron components were found, establishing the total decay energy of Po^{207} as 2.906 m.e.v.

15067* (English.) **Alpha-Emitters With Short Half-Life Induced by Protons on Heavy Elements.** P. A. Tove. *Arkiv för Fysik*, v. 13, no. 6, 1958, p. 549-578.

New data for α-emitters in the region between U and Bi are given.

15068* (German.) Physical Conditions for the Production of Energy by Means of Nuclear Fusion. **Physikalische Bedingungen für die Energieerzeugung durch Kernverschmelzung (Fusion).** H. Grümm. *Atomkernenergie*, v. 3, no. 7, July 1958, p. 266-272.

A study of charge carrier concentration in connection with the container, magnetic wall, and "pinch effect". Production concentrated clouds of full ionized gases. Special properties of the plasma. Present state of the experimental investigation; the "Zeta" equipment.

15069* (German.) The Measuring Methods of Nuclear Physics. **Kernphysikalische Messmethoden. IV.** Calorimetric Measurements and Charge Measurement. **Kalorimetrische Messungen und Ladungsmessung.** Werner Braunbek. *Atomkernenergie*, v. 3, no. 7, July 1958, p. 277-279.

The transport of energy by corpuscular or quantum radiation. Transport of electric charge by corpuscular radiation. The necessity of highly sensitive calorimeters: adiabatic, differential. and vaporization calorimeters. Description of the apparatus of Clark to measure the charge.

15070* Methods for Numerical Calculations With the Type I Counter. P. G. Guest. *Australian Journal of Physics*, v. 2, no. 2, June 1958, p. 143-153.

A Type I counter is one in which each count is followed by a fixed dead time τ during which the counter is insensitive, the counter returning to the sensitive condition at the end of the period τ. Any event occurring in the dead time has no effect. Detailed schemes have been prepared for performing numerical caluculations of frequency, expectation, and variance. Tables are given of the deviations of the asymptotic formulas from the exact formulas when the time of observation is small.

15071* The Ionization of Liquid Argon by α-Particles. F. D. Stacey. *Australian Journal of Physics*, v. 2, no. 2, June 1958, p. 158-167.

Calculations suggest that in liquid argon the column of ionization produced by an α-particle consists of a core of positive charge 0·6-1·5 x 10^{-5} cm. in diameter concentric with a larger cloud of electrons extending to a diameter of 40 x 10^{-5} cm. This leads to a new description of charge separation in an applied electric field, in which the positive and negative charges are drawn apart slightly (polarized) and the more energetic electrons escape from the edge of the column. The remaining electron cloud reaches a state of dynamic equilibrium with the excess positive charge in a time short compared with that required for ionic recombination, which does not have a significant effect on the ionization current.

15072* (German.) Thoughts on the Future of the Atomic Industry in Western Germany. **Gedanken zur Zukunft der westdeutschen Atomwirtschaft.** Some Lessons of the Year 1957 for the German Reactor Development. **Einige Lehren des Jahres 1957 für den deutschen Reaktorbau.** Fr. Münzinger. The Atom Industry as Part of the German Industrial Economy. **Atomwirtschaft, ein Teil der Industriewirtschaft.** S. Balke. On the Development of Nuclear Energy in the Federal Republic. **Zur Kernenergieentwicklung in der Bundesrepublik.** K. Wirtz. *Brennstoff-Wärme-Kraft*, v. 10, no. 7, July 1958, p. 313-320.

15073* Controlled Thermo-Nuclear Research. John Cockcroft. *British Institution of Radio Engineers, Journal*, v. 18, July 1958, p. 398-400.

Authoritative background information on important advances in nuclear engineering.

15074* (French.) Research and Experience of the Problem of Radioactive Substances in Water. **Recherches et expériences sur le problème des substances radio-actives contenues dans l'eau.** Herbert Köhle. *Centre Belge d'Étude et de Documentation des Eaux, Bulletin No.* 40, 1958, p. 124-133.

Utilization of water in reactors and the danger of contamination. Methods and instruments for detection of radiation.

15075 Instrumentation for a Boiling Water Reactor. Lester Kornblith, Jr. *Electrical Engineering*, v. 77, Aug. 1958, p. 696-698.

Description of a reactor plant, the nuclear instrumentation, steam plant instrumentation, and operating experience.

15076 Electromagnetic Isotope Separators and Applications of Electromagnetically Enriched Isotopes. J. Koch, editor. 314 pp. 1958. Interscience Publishers, New York. (TP156.17 K81e)

Laboratory instruments and the large scale production units are described separately. Gives an impression of the historical development, especially to show how the many complex difficulties were solved in the course of time, frequently on an empirical basis.

15077 Determining Arrival Time of Radioactive Fallout. Ross W. Farmer and Oscar Reiner, Jr. *Electronics* (Engineering Edition), v. 31, no. 31, Aug. 1, 1958, p. 69-71.

Standard electric automobile clock operates until fallout at levels greater than two milliroentgens per hour arrives. At that time Geiger-counter detection circuit blows power-supply fuse causing clock to stop with hands indicating time of arrival of fallout. Instrument will operate for about four weeks on self-contained batteries and regulated transistor high-voltage power supply.

15078 Calculations on the Rate of Swelling of Gas Bubbles in Uranium. A. J. E. Foreman. *Great Britain, Atomic Energy Research Establishment, A.E.R.E. T/M*134, 1958, 15 pp. (UF767 G79.1a Contin.)

The rate of swelling of irradiated U is found on the basis of the gas bubble model for steady irradiation of U at a constant temperature, and the annealing of U previously irradiated at a lower temperature at which little swelling occurred.

15079 Management and Operation of a Privately Owned Hot Cell Facility. G. D. Calkins and J. E. Whitney. Paper from "Hot Laboratory Operation and Equipment". v. III, p. 42-46, 1957. Pergamon Press, New York. (TK9006 N88 Over.)

The results of a year and half of experience in the management and operation of Battelle's hot cell facility are described. Important factors are reviewed, incuding the type of work conducted, method of operation, organization and training of the staff, multiple-shift operation, and typical costs of operation.

15080 Neutron Generation From Straight Pinches. R. E. Dunway and J. A. Phillips. *Journal of Applied Physics*, v. 29, Aug. 1958, p. 1137-1143.

Experiments on the neutrons produced in deuterium gas during a high-current pulsed discharge are described.

15081 A High Voltage Electron Injector Gun for Synchrotrons. E. W. V. Acton and K. T. W. Milne. *Journal of Scientific Instruments*, v. 35, no. 7, July 1958, p. 245-247.

An improved demountable electron injector gun designed primarily for use in 140 and 30 m.e.v. synchrotrons is described.

15082 Metallurgy in Nuclear Engineering, Survey of the Literature in 1957. I. J. Burkett. *Metallurgia*, v. 58, July 1958, p. 32-36.

Materials of construction. their properties, and the effects of irradiation on them. (To be continued.)

15083* Atomics. Characteristics and Effects. Hunter L. Stockton. *Military Review*, v. 38, no. 5, Aug. 1958, p. 21-43.

An excellent treatise of the basic technical aspects of nuclear employment in military operations. (To be concluded.)

15084 Metallurgy and Cost of Nuclear Fuel. B. W. Dunnington. *News in Engineering at Ohio State University*, v. 30, no. 3, July 1958, p. 16-17.

Current costs of the nuclear fuel cycle are high because the cost of fuel is high and the efficiency of use is low. A better use and a lower cost can be achieved by better design, but the required data are not available. Additional testing will provide better data for design, and more experience in fabrication will reduce the original costs. Power costs of four mills per kwh for the fuel cycle alone seem reasonable in the next few years, and costs as low as two mills per kwh are distinctly possible.

15085 Nuclear Moments. H. Kopfermann. (Translated from the German by E. E. Schneider.) 2nd Ed. 505 pp. 1958. Academic Press, New York. (QC173 K83k2tr)

Covered as separate chapters are nuclear moments in free atoms, free molecules, liquids and crystals, and applications of nuclear models.

15086 Nuclear Reactor Experiments. J. Barton Hoag, editor. 480 pp. 1958. D. Van Nostrand Co., Princeton, N. J. (QC784 Un3.1n)

A laboratory book for instruction in the field of nuclear science and engineering with 44 contributors.

15087 Nuclear Scattering. K. B. Mather and P. Swan. 469 pp. 1958. University Press, Cambridge. (QC173 M42n)

The physics of scattering, including the experimental techniques, and significant experimental results and their interpretation in terms of nuclear forces and nuclear structure are described.

15088* The Age of Polonium-Beryllium Neutrons in Various Metal-Water Mixtures. Melvin Reier, Felix Obenshain, and Robert L. Hellens. *Nuclear Science and Engineering*, v. 4, July 1958, p. 1-11.

The slowing-down distribution of Po-Be neutrons was measured in Al-, Zr-, and iron-water mixtures up to metal water ratios of 2:1 by volume. The second moment of the distribution was obtained from these measurements and compared with theoretical calculations based on a solution of the transport equation. The effect of varying the source spectrum and cross sections in the calculations is discussed.

15089* Neutron Age in Mixtures of D_2O and H_2O. James W. Wade. *Nuclear Science and Engineering*, v. 4, July 1958, p. 12-24.

The neutron age for fission neutrons and Po-Be neutrons was measured in mixtures of D_2O and H_2O. The age was evaluated from the second moment of the slowing-down distribution at the 1.4-e.v. resonance of In.

15090* The General Critical Reactor Equations. M. J. Nowak. *Nuclear Science and Engineering*, v. 4, July 1958, p. 25-43.

A general formulation of these equations is made to include space and velocity variation; the noncritical reactor is treated by using the effective multiplication factor. Two methods are developed for solving the general equation by splitting it into a pair of simultaneous equations: the space-energy split and the fission source split. By using unit sources, one equation can be inverted to obtain a pair of integral equations for iterative solution of the general equation.

15091* Analysis of Temperatures and Expansions Resulting From Exponential Power Changes in a Reactor. Thomas R. Bump and Ralph W. Seidensticker. *Nuclear Science and Engineering*, v. 4, July 1958, p. 44-64.

Simple, analytical expressions for temperatures and axial fuel expansions in an exponentially heated, heterogeneous reactor are derived. Constant thermal resistances, equal to the steady-state values, are assumed, and the effects of using this assumption are discussed. Multiregion fuel elements are treated, both with and without coolant flow. The effect of mechanical inertia upon axial expansion of fuel rods with one fixed end is taken into account. Numerical examples which pertain to EBR-II are presented.

15092* Control Rod Worth Studies on Seed and Blanket Reactors. W. H. Hartley and R. T. Bayard. *Nuclear Science and Engineering*, v. 4, July 1958, p. 65-72.

A technique is described for determining control rod shutdown reactivity for tall reactors (small relative axial leakage) which may also be applicable to other reactor geometries. This method assumes that the rod bank region is an exponential assembly with the critical portion of the reactor as the driving source for the exponential. Comparison is made with the results obtained from the rod drop technique.

15093* A System of Obtaining and Reducing Neutron Flux Data From a Critical Assembly. H. A. Morewitz and R. F. Valentine. *Nuclear Science and Engineering*, v. 4, July 1958, p. 73-81.

Some new techniques have been applied in the determination of relative neutron fluxes in water moderated critical assemblies. Alloy wires of Mn-Fe, In-Al, Au-Al, and U-Zr have been prepared with a high degree of uniformity between individual samples of a given material. Beta activation of these wires is measured by thin scintillation crystals in conjunction with specially stabilized electronics. This procedure results in good "plateaus" of counting rate vs. photomultiplier voltage, discriminating setting, and amplifier gain.

15094* Hydrodynamics of a Liquid Poison Scram System. David Burgreen. *Nuclear Science and Engineering*, v. 4, July 1958, p. 82-95.

A study is made of the transient motion of a suddenly released column of liquid poison, such as Hg or borated water, as it moves through the control tubes of a reactor. Two basic systems are described. The first system consists of a tank of liquid poison, situated above the reactor, connecting directly to control tubes extending down into the core. The second system is a U-tube arrangement in which the liquid poison enters through tubes that extend upward from the base of the core. By making the tank or standpipe diameter larger than the control tube diameter it is possible to obtain initial fluid column accelerations greater than gravitational acceleration.

15095* Suppression of Neutron-Induced Activation Outside a Hydrogenous Shield. Fritz W. Mezger. *Nuclear Science and Engineering*, v. 4, July 1958, p. 96-111.

Two methods are evaluated: the addition of a $1/v$ absorber to the hydrogenous shielding material, and the addition of a layer of $1/v$ absorbing material to the outside of the shield. When the material being activated has a $1/v$ cross section, a closed-form solution is obtained. The results should prove valuable in determining to what extent activation outside a shield can be reduced by any combination of these two methods.

15096* Interstitial Compounds of Irradiated Graphite. G. L. Montet. *Nuclear Science and Engineering*, v. 4, July 1958, p. 112-133.

As the result of an attempt to prepare unordered compounds of graphite containing more than 1.5×10^{-3} acceptor per carbon atom by the introduction of both chemical acceptors and radiation damage centers, evidence has been found for mutual destruction of chemical acceptors and damage centers. An analysis of the kinetic behavior of the mutual destruction indicates that the extent of destruction is independent of the order in which the radiation damaging and chemical treatments are carried out. Experiments indicate that the graphite bisulfate residue compounds are stable at room temperature, and that the bisulfate ion is not appreciably decomposed by the γ flux in the reactor during short irradiations.

15097 Nuclear Structure. Leonard Eisenbud and Eugene P. Wigner. 128 pp. 1958. Princeton University Press, Princeton, N. J. (QC173 Ei83n)

Tries only to acquaint the reader with the points of view which are considered useful and interesting for the analysis of large groups of nuclear phenomena and among which he may wish to choose one or more for detailed study. This book will also appear in the *Handbook of Physics*.

15098 Nuclear Particle Track Photography in Electric Fields. I. E. Bock. *Philosophical Magazine*, v. 3, no. 31, July 1958, p. 715-717.

Light emitted by liquid scintillators may be increased by application of a suitable a.c. field.

15099 Convergence of the Method of Moments. Francis R. Halpern. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 1-2.

A proof is given that the nth approximation of the method of moments in convergent when applied to the polaron problem.

15100 Annihilation of Positrons in Organic Compounds. Charles R. Hatcher, W. E. Millett, and Louis Brown. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 12-15.

The mean life τ_2 and the fraction I_2 of positrons which decay with a "long" 10^{-9}-sec. lifetime have been measured in several organic compounds, most of which are derivatives of benzene. For the long components observed in liquids τ_2 ranges from 1.6×10^{-9} sec to 2.5×10^{-9} sec, whereas I_2 varies from 35% to

4%. A correlation between I_2 and certain properties of the molecules indicates a qualitative explanation of the results.

15101 Electron - Coupled Interaction Between Nuclear Spins in HD Molecule. Eiichi Ishiguro. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 203-208.

15102 Proton-Proton Scattering at 40 Mev. L. H. Johnston and D. A. Swenson. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 212-222.

Differential cross sections have been measured for the scattering of 39.4 m.e.v. protons by H gas at angles from 45 to 4° in the laboratory system, with ±½° angular resolution at small angles. Data are given for every half degree near the interference minimum.

15103 Analysis of 40-Mev *p-p* Scattering. H. Pierre Noyes and Malcolm H. MacGregor. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 223-227.

Analysis of the 40 m.e.v. *p-p* scattering data of Johnston and Swenson shows that either the singlet proton-proton interaction gives an anomalously large *D* wave and an anomalously small S wave at 40 m.e.v., or that angular momentum states in addition to *S*, *P*, and *D* are present.

15104 Short Lived Isotopes of Pd and Ag of Masses 113-117. J. M. Alexander, U. Schindewolf, and Charles D. Coryell. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 228-236.

Six new short-lived Pd and Ag isotopes have been isolated from the fission products by fast chemical separations. Their decay properties have been studied by β and γ counting and spectroscopy or by periodic extractions of daughter activities.

15105 Possible Experiments for Determination of Beta Interactions. I. M. Morita, R. S. Morita, and M. Yamada. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 237-244.

Some possible experiments are proposed for deciding the relative strength of scalar and vector interactions and that of tensor and axial vector interactions in β decay. For all the proposed experiments, it is necessary to measure the recoil of the nucleus directly or the nuclear resonance fluorescence caused by a γ-ray which follows the β decay or *K* capture.

15106 Calculation of the $O^{16}(d,p)O^{17}$ Angular Distribution. John L. Richter and Eugene V. Ivash. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 245-249.

Results of calculations based on the Tobocman theory are presented for the angular distribution of the outgoing protons produced by the $O^{16}(d,p)O^{17}$ stripping reaction in which the residual nucleus is left either in the ground state or in the first excited state, and for incident energies well below the Coulomb barrier. A variety of nuclear models are examined, including the optical model, and the theoretical distributions compared with experimental ones.

15107 Scattering of 14.5-Mev Neutrons by Complex Nuclei. J. H. Coon, R. W. Davis, H. E. Felthauser, and D. B. Nicodemus. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 250-260.

New measurements of the differential elastic scattering cross sections of C, Al, Fe, Cu, Sn, Pb, and U for 14.5 m.e.v. neutrons are reported. For Fe, Cu, Sn, and Pb, the angular range from 5 to 150° was investigated with ±1 to ±3° angular resolution. For the other elements a smaller angular range was investigated.

15108 Neutron Cross Sections and Scattering Lengths of Cu^{63} and Cu^{65}. D. T. Keating, W. J. Neidhardt, and A. N. Goland. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 261-263.

15109 Reaction Mechanism in $F^{19}(\alpha,p)Ne^{22}$ at 6 Mev. G. F. Pieper and N. P. Heydenburg. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 264-271.

Angular distributions of protons corresponding to the ground-state and first excited-state transitions in the reaction $F^{19}(\alpha, p)Ne^{22}$ have been measured for five bombarding energies in the region of 6.0 to 6.55 m.e.v. Angular correlations of the de-excitation γ-ray from the first excited state of Ne^{22} with the α-particle and proton directions have been measured for six different combinations of bombarding energy and proton detection direction. Some, but not all, of the results show striking agreements with predictions based on simple direct-interaction mechanisms.

15110 Photodisintegration of the Deuteron in the Medium Energy Range. J. J. De Swart and R. E. Marshak. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 272-276.

Photodisintegration was calculated using the Gartenhaus wave function for the deuteron and the Gartenhaus plus spin-orbit wave functions for the final states. The results are in good agreement with experiment. It is shown that the cross sections are sensitive to the triplet odd scattering phase shifts and the *D*-state probability, but rather insensitive to the detained shapes of the wave functions. The results indicate that it is not necessary to relinquish Siegert's theorem in order to explain the large isotropic term in the angular distribution in this energy region, provided one assumes a rather high percentage of *D* state (7%) for the ground state of the deuteron.

15111 Elastic Scattering of Alpha Particles by Carbon-14. James A. Weinman and Edward A. Silverstein. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 277-283.

The elastic scattering of α particles by C^{14} has been observed for α energies between 2.0 and 3.9 m.e.v. and for $\theta_{c.m.}$=169, 149.5, 140.8, 125.3, and 90°. The solid targets of 38.6% C^{14} were at least 8 k.e.v. thick. Energies of both the incident and scattered particles were measured with cylindrical electrostatic analyzers.

15112 Spins of Indium-109, Indium-110*m*, and Indium-111. Lawrence L. Marino, et al. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 286-287.

The nuclear spins of three neutron-deficient radioactive isotopes of indium have been measured by the use of the atomic-beam magnetic-resonance technique. Results are I=9/2 for 4.3-hr. In^{109}, I=7 for 5.0-hr. In^{110}m; and I=9/2 for 2.8-day In^{111}.

15113 Scattering of μ^- Mesons by Nuclei. J. Franklin, B. Margolis, and H. Oberthal. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 296-297.

Previous hand calculations for the scattering of μ^- mesons by nuclei have been extended by using a IBM-650 computer, to include energies corresponding to v/c=0.2(E=2.1 m.e.v.) and 0.4(E=9.6 m.e.v.) for the nuclei Z=48 and 80, the nucleus being considered as a uniformly charged sphere of radius R=1.2A⅓ x 10^{-13} cm.

15114 Scattering of 220-Mev Polarized Protons by Complex Nuclei. E. M. Hafner. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 297-312.

Extending earlier measurements, studies were made of yields and asymmetries in the scattering of a highly polarized proton beam by Be^9, C^{12}, Al^{27}, and Ca^{40}. In the work on Be^9 and Al^{27}, the beam was monochromatized through the use of a regenerative deflector; its mean energy on striking the targets was 219.6 m.e.v., and its standard deviation in energy (including the effect of short time fluctuations) was less than 1.1 m.e.v.

15115 Effect of the Hyperfine Splitting of a μ-Mesonic Atom on Its Lifetime. J. Bernstein, T. D. Lee, C. N. Yang, and H. Primakoff. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 313-315.

The lifetime of a μ-mesonic atom depends on its hyperfine state because of the spin dependence of the interaction between the μ-meson and the capturing proton. The small lifetime difference between the hyperfine states is estimated in a one-particle model. Possible experimental detection of such a difference is discussed.

15116 Dispersion Theory Treatment of Pion Production in Electron-Nucleon Collisions. S. Fubini, Y. Nambu, and V. Wataghin. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 329-336.

The production of mesons in electron-nucleon collisions is treated by using the method of dispersion relations. The result is analogous to that obtained by Chew, Low, Goldberger, and Nambu for photoproduction using the same method. Apart from the appearance of longitudinal and scalar components of the virtual photon polarization, the important difference is

that charge and magnetic moments have to be multiplied by the appropriate nucleon electro-magnetic form factors.

15117 Pion Decay and Possible Nonlocal Effects in the Theory of Fermi Interactions. A. Sirlin. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 337-342.

Under certain simple assumptions, an effective Hamiltonian is derived which reduces to the local $V-A$ interaction in the limit in which the momentum transfer between the two pairs of Fermi particles is very small. For larger values of the momentum transfer, corrective terms appear which may account phenomenologically for the deviations of the p value and the ratio R ($\rightarrow e+\nu)/(\pi\rightarrow\mu+\nu$) from the predictions of the local V–A theory. The pion and muon decays are analyzed in detail. Other weak processes are briefly discussed.

15118 Quantization Process for Massless Particles. C. L. Hammer and R. H. Good, Jr. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 342-345.

This paper gives the quantization of a recently proposed theory for particles of arbitrary spin and zero mass. An interesting result is that there is a connection between the spin and the statistics of the particles.

15119 Field Theory of Deuteron Exchange Currents. Lee M. Frantz. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 346-353.

The influence of pion exchange currents on the thermal capture process ($n+p\rightarrow d+\gamma$) is investigated field-theoretically. The Chew model is used for the pion-nucleon interaction, and perturbation and corresponding renormalization techniques are developed for treating a system containing two dynamic nucleons.

15120 Form Factors in β Decay and μ Capture. M. L. Goldberger and S. B. Theiman. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 354-361.

15121 Test of the Nature of the Vector Interaction in β Decay. Murray Gell-Mann. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 362-365.

15122 Proceedings of the Fifth Hot Laboratories and Equipment Conference. v. III. Hot Laboratory Operation and Equipment. John R. Dunning and Bruce R. Prentice, editors. 298 pp. 1957. Pergamon Press, New York. (TK9006 N88 Over.)

Provides an interchange of information regarding hot laboratory facilities and techniques for the designers and users in the overall interest of economy and expediency. Consists of 60 papers.

15123* The Phenomenological Model of the Interaction of Elementary Particles. Kanji Fujii and Kenzo Iwata. *Progress of Theoretical Physics*, v. 19, no. 5, May 1958, p. 475-484.

Applications to lepton processes are satisfactory.

15124* Dispersion Relations in Nucleon-Nucleon Scattering. Sadahiko Matsuyama and Hironari Miyazawa. *Progress of Theoretical Physics*, v. 19, no. 5, May 1958, p. 517-533.

The dispersion relation of Kronig and Kramers is applied. The real part of its forward scattering amplitude is expressed in terms of an integral of the total cross sections and an integral of the imaginary part over the nonphysical region.

15125* Single Particle Transition in Neutron Inelastic Scattering by Deformed Nuclei. Hiroyuki Matsunobu and Shiro Yoshida. *Progress of Theoretical Physics*, v. 19, no. 6, June 1958, p. 599-606.

15126* Isotopic Spin and Strange Particles. Gyo Takeda. *Progress of Theoretical Physics*, v. 19, no. 6, June 1958, p. 631-645.

Study of the isotopic spin change in various strange particle decays and of the conservation of the isotopic spin in the strong interactions have led to the introduction of a new and independent space (i'-space) in addition to the i-space. The i'-spin quantum number of baryons and heavy mesons, the property of the π and k couplings in the i'-space as well as in the i-space, and the decay selection rules of strange particles are determined.

15127* Quantum Mechanics of Strongly Interacting Particles With an Application to Lennard-Jones Potential. Ryuzo Abe. *Progress of Theoretical Physics*, v. 19, no. 6, June 1958, p. 713-724.

15128 (German.) Radioactive Isotopes, Their Preparation and Application. **Radioaktive Isotope ihre Herstellung und Anwendung.** Kurt Schmeiser. 246 pp. 1957. Springer-Verlag, Berlin. (QC798 Sch44r)

Atom's structure and isotopes, radioactivity, transformation of nucleus, preparation of isotopes, measurement of radiations, permeability of β-particles, detection of β-particles, exchange of γ- and α-radiation with substances, and effect of radiation and its application.

15129 Use of Freons in Bubble Chambers. David V. Bugg. *Review of Scientific Instruments*, v. 29, July 1958, p. 587-589.

The sensitive regions of several Freons in a bubble chamber have been determined. CF_3Br, Freon 13B1, has been found to be sensitive at 30 C, at which temperature the equilibrium vapor pressure is only 264 psi. Because of its pleasant handling characteristics, and the fact that it can be used in any chamber designed for propane, it is suggested that it may find considerable use as a "heavy" liquid in large chambers. The time needed for bubbles to redissolve, and the difficulties implicit in the use of mixtures of liquids are discussed.

15130 R-Matrix Theory of Nuclear Reactions. A. M. Lane and R. G. Thomas. *Reviews of Modern Physics*, v. 30, no. 2, pt. 1, Apr. 1958, p. 257-353.

Describes advances made in the theoretical study of nuclear reactions during the last 20 yrs.

15131 Table of Isotopes. D. Strominger, J. M. Hollander, and G. T. Seaborg. *Reviews of Modern Physics*, v. 30, no. 2, pt. 2, Apr. 1958, p. 585-904.

A complete list of all the radioactive and stable isotopes of the elements, together with a number of their salient features, as recorded in the literature or by private communication by approximately February, 1958.

15132* (Italian.) Investigations With Radioactive Sulfur on the Possibility of the Mechanism $2SO_3\rightleftarrows SO_2^{2+}+SO_4^{2-}$. **Indagini con zolfo radioattivo sulla possibilità del meccanismo $2SO_3\rightleftarrows SO_2^{2+}+SO_4^{2-}$.** Maria Bruno and Mario Fiorani. *Ricerca Scientifica*, v. 28, no. 4, Apr. 1958, p. 749-755.

Separation methods for SO_2 Cl_2 and SO_3 important for nuclear chemistry were evolved.

15133 Symposium on Nondestructive Tests in the Field of Nuclear Energy. 395 pp. 1958. American Society for Testing Materials, Philadelphia. (TA410 Am35snt)

The majority of papers given at this symposium presented in Chicago, Ill., April 16-18, 1957 are on testing of reactor components and testing of fuel assemblies.

15134 Radiography of Fuel Elements and Fuel Materials Using Cesium-137. Merle L. Rhoten. Paper from "Symposium on Nondestructive Tests in the Field of Nuclear Energy". p. 266-272, 1958. American Society for Testing Materials, Philadelphia. (TA410 Am35snt)

Isotopes are much slower than high-energy machine radiation, but their cost is only a small percentage of that of a high-voltage X-ray machine. Cesium-137, therefore, is a valuable source of radiation for radiography of the heavy metals in fuel elements.

15135 Extended Zero Power Experiments on the Army Package Power Reactor ZPE-2. J. W. Noaks, editor. *U. S. Atomic Energy Commission, APAE-21*, Nov. 15, 1957, 203 pp. (UF767 Un3.1apa Contin.)

Experiments were performed using APPR-1 fuel elements in cores having various diameters, metal to water ratios, and boron-10 distributions.

15136 APPR-1, Design, Construction & Operation. *U. S. Atomic Energy Commission, APAE-23*, Nov. 20, 1957, 175 pp. (UF767 Un3.1apa Contin.)

Consists of nine papers presented at Second Winter Meeting of the American Nuclear Society on October 28, 1957 in New York.

15137 Quarterly Progress Report, October 1-December 31, 1957. *U. S. Atomic Energy Commission, BNL-484* (S-40), Apr. 1958, 50 pp. (UF767 Un3.1bn Contin.)

Covers the unclassified research progress of the laboratory. Abstracts only are given for research activities reported elsewhere.

15138 Gas Cooled Pebble Bed Reactor for a Large Central Station. A. Schock, et al. *U. S. Atomic Energy Commission, CF-57-8-12*, Aug. 1957, 323 pp. (UF767 Un3.1cf Contin.)

This study is to determine an optimum economic design for a high temperature, He cooled, central station reactor power plant of about 400 MW of electric power. The core consists of a randomly packed bed of unclad graphite spheres, approximately one inch in diameter, impregnated with U-233 and Th such that a conversion ratio of near unity is achieved. The high temperature He permits steam conditions, at the turbine throttle, of 1000 F and 1450 psia.

15139 Formation of U-232 During the Irradiation of Thorium. D. S. St. John and E. C. Toops. *U. S. Atomic Energy Commission, DP-279*, Apr. 1958, 19 pp. (UF767 Un3.1dp Contin.)

The formation of U-232 by (n,2n) reactions in pile-irradiated Th is discussed. For Th irradiated in a heterogeneous reactor, the total U-232 formed is produced by fast neutrons from two sources: those which originate in the surrounding fuel elements, and those produced by the fissioning of U-233 in the Th itself.

15140 Plutonium Recycle Test Reactor Preliminary Safeguards Analysis. N. G. Wittenbrock, editor. *U. S. Atomic Energy Commission, HW-48800* (Rev.), June 5, 1958, 251 pp. (UF767 Un3.1hw Contin.)

The PRTR is a vertical pressure tube type reactor, heavy water moderated and cooled, with a thermal power rating of 70 megawatts. Control of the reactor is achieved by regulating the level of the heavy water moderator, which is held in the reactor vessel by a He gas balance system.

15141 Nuclear Physics Research Quarterly Report, January, February, March 1958. *U. S. Atomic Energy Commission, HW-55879*, Apr. 29, 1958, 42 pp. (UF767 Un3.1hw Contin.)

Reports progress in 10 projects at the Hanford Atomic Products Operation.

15142 The Application of Statistical Methods of Analysis and Experimental Design in Predicting Burnout Heat Flux. R. T. Jacobs, J. A. Merrill, and R. J. Nertney. *U. S. Atomic Energy Commission, IDO-16460*, June 30, 1958, 34 pp. (UF767 Un3.1id Contin.)

Statistical methods have been applied to the subcooled burnout data published by UCLA, Purdue, BMI, and McAdams to obtain a single correlation relationship of the polynomial type.

15143 Semi-Annual Summary Research Report in Engineering for July-December 1957. *U. S. Atomic Energy Commission, ISC-978*, Mar. 10, 1958, 31 pp. (UF767 Un3.1is Contin.)

Gives summaries of 16 projects in chemical, nuclear, or ceramic engineering.

15144 Critical Masses of Oralloy in Thin Reflectors. G. E. Hansen, H. C. Paxton, and D. P. Wood. *U. S. Atomic Energy Commission, LA-2203*, July 16, 1958, 35 pp. (UF767 U3La Contin.)

Critical masses were measured for 5¼-in. diameter Oy cylinders in ¾ and 1-in. thick reflectors of Be, graphite, Mg, Al, Ti, mild steel, Cu, W alloy, Ni, Co, Mo, Al_2O_3, Mo_2C, and polythene.

15145 Homogeneous Reactor Project. Quarterly Progress Report for Period Ending Jan. 31, 1958. *U. S. Atomic Energy Commission ORNL-2493*, Aug. 7, 1958, 193 pp. (UF 767 U3o Contin.)

HRT developments, HRE-3 progress, and other accomplishments are reported.

15146 Nuclear Reaction Cross Sections From the Nitrogen Bombardment of Sulfur. D. E. Fisher. *U. S. Atomic Energy Commission, ORNL-2535*, July 29, 1958, 67 pp. (UF767 U3o Contin.)

Natural S was bombarded with N ions at incident energies ranging from 20 to 28 m.e.v. At this latter energy the V^{46} compound nucleus is excited to 33.3 m.e.v. Nineteen reactions were computed to be possible results of evaporation from a compound nucleus.

15147 Calculation of the Photoneutron Flux in the Water Near the Bulk Shielding Reactor. G. deSaussure. *U. S. Atomic Energy Commission, ORNL-2545*, July 29, 1958, 8 pp. (UF767 U3o Contin.)

The measurement of the γ-ray dose rate at a distance 267 cm. from the Bulk Shielding Reactor was used to estimate the photoneutron flux at that point. The resulting calculated flux was 1.65×10^{-8} neutron·w^{-1}·sec^{-1}·cm^{-2}. This is to be compared with a measured value of the thermal-neutron flux of 1.58×10^{-8} neutron·w^{-1}·sec^{-1}·cm^{-2}, all of which is assumed to consist almost entirely of photoneutrons.

15148 Nuclear Structure Effects in Internal Conversion Coefficients by Configuration Mixing. L. S. Kisslinger. *U. S. Atomic Energy Commission, ORNL-2556*, Aug. 6, 1958, 53 pp.

The nuclear matrix elements which are needed to determine the internal conversion coefficients when a finite nucleus is employed are derived for nuclei for which the shell model wave functions are a good zero-order approximation for low-energy processes.

15149 International Conference on the Neutron Interactions With the Nucleus, Proceedings, September 9-13, 1957. W. W. Havens, Jr., editor. *U. S. Atomic Energy Commission, TID-7547*, Sept. 1957, 279 pp. (UF767 Un3ti Contin.)

Papers on low energy neutron spectroscopy, neutron interactions with fissionable nuclei, fission physics, fast neutron cross sections, and neutron capture γ-rays were presented.

15150 Reactor Safety Conference, New York City, October 31, 1957. *U. S. Atomic Energy Commission, TID-7549* (pt. 2), Apr. 1958, 43 pp. (UF767 Un3ti Contin.)

Six papers were presented on containment problems and economics of reactor safety.

15151 Design, Construction, and Operation of Engineering Test Reactor. *U. S. Atomic Energy Commission, TID-7552*, Oct. 1957, 102 pp. (UF767 Un3ti Contin.)

Twelve papers presented at Engineering Test Reactor Industrial Preview, Idaho Falls, Idaho, October 2 and 3, 1957.

15152 Nuclear Studies in the Rare Earth Region. Kenneth S. Toth. *U. S. Atomic Energy Commission, UCRL-8192*, Mar. 1958, 115 pp. (UF767 U3u Contin.)

Alpha particles from the Berkeley 60-in. cyclotron were used to bombard rare earth oxides to study the neutron-deficient isotopes in the rare earth region. Six new isotopes were discovered and their mass numbers determined.

15153 The Cross-Section of the Reaction U^{234} (α, 4n) Pu^{234}. Glen E. Gordon. *U. S. Atomic Energy Commission, UCRL-8215*, Mar. 1958, 10 pp. (UF767 U3u Contin.)

15154 Decay Schemes. D. Strominger and J. M. Hollander. *U. S. Atomic Energy Commission, UCRL-8289*, June 1958, 48 pp. (UF767 U3u Contin.)

Data are arranged according to mass number so as to show the various isobaric and parent-daughter relationships encountered in α and β decay.

15155 Theoretical Studies of the Alpha Decay of Deformed Nuclei. Richard R. Chasman. *U. S. Atomic Energy Commission, UCRL-8294*, June 1958, 40 pp. (UF767 U3u Contin.)

The α decay of a deformed odd-mass nucleus, U^{233}, is treated by the use of numerical integration on an IBM-650 computer.

15156 Work With a Noble Gas Scintillation Counter. Jackson R. Pickens. *U. S. Atomic Energy Commission, UCRL-8295*, May 21, 1958, 33 pp. (UF767 U3u Contin.)

More than 1450 runs have been made and analyzed using a noble gas scintillation counter consisting of a special photomultiplier tube looking into a scintillation chamber. A mixture of purified A and He is used.

15157 π^--p Elastic Scattering and Single Pion Production at 0.939 Bev/c. Lee Baggett, Jr. *U. S. Atomic Energy Commission, UCRL-8302*, May 28, 1958, 59 pp. (UF767 U3u Contin.)

Five-hundred and forty two-prong interactions in the 10-in. UCRL liquid-hydrogen bubble chamber have been classified. Emphasis is given the methods used in the kinematic classification of events.

15158 The Bettis Technical Review. Reactor Chemistry and Plant Materials. *U. S. Atomic Energy Commission, WAPD-BT-7*, Mar. 1958, 156 pp. (UF767 Un3.1wb Contin.)

A collection of 14 papers describing plant progress. Some extend into other fields of interest.

15159 Primary Coolant System Activities Due to a Burst Source of Fission Products. P. W. Frank and B. D. O'Reilly. *U. S. Atomic Energy Commission, WAPD-TM-136*, May 1958, 18 pp. (UF767 Un3.1wa Contin.)

A formal mathematical description of the time dependence of activity in the main coolant loop of a pressurized water reactor resulting from the discontinuous release of core contained fission products is developed. The description accounts for the deposition, re-solution, and demineralization of activities due to one, two, and three member mass chains.

15160 Naval Research Laboratory Research Reactor. V. Effects of Air Voids and Fuel-Free Regions. K. W. Marlow, E. I. Nowstrup, and R. H. Vogt. *U. S. Office of Naval Research. NRL Report* 5142, June 26, 1958, 17 pp. (T21 Un3.5n Contin.)

The reactivity effects of air voids in the reflector and in the core of the NRL Research Reactor were measured for a number of typical reactor configurations. Six voids were used, ranging in size from a 2-ft. cube in the reflector to a 1¾-in. cylindrical void in the core. All voids in the reflector required additional fuel to compensate for their presence; voids in the core required the removal of fuel. In all cases, the interposition of Cd between the reflector voids and the reactor prevented large reactivity increases when the voids were flooded with water. Reactivity changes were measured by subcritical multiplication, by addition of fuel, and with calibrated rods.

See also: **14321** (Ar analysis in coolant water); **14322** (U^{235} analysis in fuel elements); **14369** (chemical effects of radiation); **15058** (inspection of Zr-clad fuel elements); **15190** (thermonuclear reactions); **15204** (effects of γ-radiation); **15225** (thermonuclear reactions); **15288** (radioactive fallout).

OPERATIONS RESEARCH AND MANAGEMENT ENGINEERING

15161 Creativeness for Engineers. Donald Stuart Pearson. 122 pp. 1958. Donald S. Pearson, University Park, Pa. (Q175 P31c)

Presents a philosophy and practice for scientific thinking and a guide to follow in the practice of creativeness.

15162 Developing Executive Skills. New Patterns for Management Growth. Harwood F. Merrill and Elizabeth Marting, editors. 431 pp. 1958. American Management Assn., New York. (HF5500 Am35d)

Companies, today, are solving the shortage of executive manpower through systematic programs of management development which improve executive skills and stimulate managerial growth. This book offers a comprehensive presentation of this vital subject.

15163 Automation, 1958: Industry at the Crossroads. I. The Record to Date. II. The Shape of Things to Come. John Diebold. *Dun's Review and Modern Industry*, v. 72, no. 2, Aug. 1958, p. 36 + 8 pages.

15164* Cybernetics, Operational Research, and Automation. F. H. George. *Instrument Practice*, v. 12, July 1958, p. 747-755.

Sets out general picture of what cybernetics and operational research are about, and then indicates their relation to automation. Shows that there is a great need to understand the fundamental principles on which all automatic control is based, since it represents a very general scientific methodology with far-reaching consequences.

15165 The Size of Research and Engineering Teams. R. B. Kershner. *IRE Transactions on Engineering Management*, v. EM-5, no. 2, June 1958, p. 35-38. (TK1 In6.6em Vis.)

The problem of overstaffing in a large development engineering effort, and a number of the technical, organizational, and psychological problems that lead to inefficiency in the engineering effort are discussed.

15166 Operational Research as a Staff Service for Management. B. M. Brough. *Operational Research Quarterly*, v. 9, no. 2, June 1958, p. 126-143.

The scientific approach to management problems; factors determining the effectiveness of operational research; relationship between O. R. and other management tools; the concept of internal management consultancy.

15167* An Integrated Process Control System at the Cummins Engine Company. E. Leonard Arnoff, Eugene B. Kania, and Elizabeth Small Day. *Operations Research*, v. 6, no. 4, July-Aug. 1958, p. 467-497.

Results are expressed as decision rules, some of which serve as tools for clerical personnel; others are the bases of logical decisions for an electronic digital computer.

15168* Optimizing a Catalytic Cracking Operation by the Method of Steepest Ascents. Robert W. Schrage. *Operations Research*, v. 6, no. 4, July-Aug. 1958, p. 498-515.

A typical example is presented in trying to find the optimum operating conditions for a fluid catalytic cracking unit. As a first step an elaborate mathematical model of the catalytic cracking operation was developed.

15169 Scientific Programming in Business and Industry. Andrew Vazsonyi. 474 pp. 1958. John Wiley & Sons, New York. (HF5500 V47s)

An attempt to develop a mathematical language which can be understood by businessmen using scientific techniques to solve managerial problems. The book is written for management personnel, with scientific techniques explained, not in terms of mathematics, but in terms of business.

See also: **14745** (operations research bibliography).

ORE AND MATERIALS BENEFICIATION

15170* New Process Achieves Direct Reduction of Iron Ore. *Canadian Mining Journal*, v. 79, Aug. 1958, p. 78-80.

More details on the Strategic-Udy process.

15171* Fatty Acids in Flotation. Carl Du Rietz. *Canadian Mining Journal*, v. 79, Aug. 1958, p. 81-87.

A new "precipitation constant" has been evolved for the formulation of solubility functions of salts of weak and slightly soluble acids, and its value has been determined for the metal salts of different fatty acids.

15172* The Influence of the Adsorption of Frothing Agent on the Percentage Recovery of Coal From Flotation Pulps. A. Jowett. *Institute of Fuel, Journal*, v. 31, no. 210, July 1958, p. 308-318.

Cresylic acid frothing agent is removed rapidly from solution in flotation pulps by many Australian bituminous coals, the rate of removal of frothing agent being directly proportional to the pulp density.

15173 High-Grade Iron Ore at Copper Cliff, Ontario. Paul Queneau, E. H. Bracken, and Daniel Kelly. *Journal of Metals*, v. 10, Aug. 1958, p. 527-532.

Problem of high Fe content of Ni concentrates has been solved by separating an Fe concentrate of low Ni and S content.

15174* Eagle Mill Recovers More Metal From Complex Ore. F. J. Witthauer. *Mining World*, v. 20, no. 9, Aug. 1958, p. 42-45.

15175 Physical Processes in the Chemical Industry. v. I. Separation and Purification of Materials. Rolt Hammond. 327 pp. 1958. Heywood & Co., Ltd., London. (TP155 H18.4s)

Covers solid-solid, solid-liquid, solid-gas, liquid-liquid, liquid-gas, and gas-gas systems with a final chapter on separation and purification in nuclear engineering.

15176 Physical Processes in the Chemical Industry. v. II. Dispersion of Materials. Rolt Hammond. 230 pp. 1958. Philosophical Library, New York. (TP155 H18.4d)

Principles and practice of comminution, fluidization, flotation, liquid dispersion, dispersion of gases, and air pollution are covered.

15177 Progress in Mineral Dressing. Transactions of the International Mineral Dressing Congress, Stockholm, 1957. Einar Öhman, editor. 754 pp. 1958. Almqvist & Wiksell, Stockholm. (TN500 In8t)

Contains 34 papers on comminution; classification and gravity separation; magnetic concentration, roasting and sintering; flotation; mineral processing by chemical methods.

15178* (Polish.) Study of the Selective Enrichment of the Sands Containing Zirconium. **Studia nad selektywnym wzbogaceniem bałtyckich piasków cyrkonośnych.** Karol Akerman, Jan Krajewski, Michał Ryczek, and Klemens Kruszewski. *Przemysł Chemiczny*, v. 37, no. 5, May 1958, p. 343-349.

By selective gravitational, electrostatic, and electrodynamic enrichment, concentrates of zircon, magnetite, ilmenite, almandine, and staurolite were prepared from sands on the Polish coast.

15179* (Italian.) Analytical Research on Italian Uraniferous Ores. **Ricerche analitiche su minerali uraniferi italiani. II.** Separation From Acid and Basic Lyes of the Uranium Contained in an Italian Autunitic Rock. **Separazione da liscivie acide e basiche dell'uranio contenuto in una roccia autunitica piemontese.** Maria Lucco Borlera. *Ricerca Scientifica*, v. 28, no. 3, Mar. 1958, p. 523-532.

See also: **14342** (ion exchange membrane for preparation of uranium salts).

PHYSICS

15180 Diffraction Effects in the Ultrasonic Field of a Piston Source. R. Bass. *Acoustical Society of America, Journal*, v. 30, July 1958, p. 602-605.

Particular reference is given to the measurement of ultrasonic absorption in liquids by the pulse technique at frequencies of 1 Mc/sec and above. A relationship given by Williams for the acoustic pressure, integrated over a "measurement circle" equal in area to and coaxial with the source, is used to develop a new formula representing the apparent attenuation due to diffraction. It covers all distances between source and detector larger than the ridius of the source irrespective of the ultrasonic wavelength in the medium.

15181 Ultrasonic Dispersion and Absorption in *n*-Hexane Vapor. Jules Z. Klose. *Acoustical Society of America, Journal*, v. 30, July 1958, p. 605-609.

The velocity of H.F. sound waves in *n*-hexane vapor at 35.15 C has been measured at frequencies of 998.5 kc. and 687.0 kc. and at pressures ranging from 1.10 to 12.28 cm. Hg, using an ultrasonic interferometer. The dispersion which was detected in the velocity is attributed to the slow rate of energy exchange between the translational and vibrational states of the molecule. Although the upper limiting sound velocity could not be reached experimentally owing to weak response at low pressures and strong absorption at high frequencies, it was established that the inflection point in the velocity vs. frequency/pressure curve lay at 137 Mc. sec.$^{-1}$ atmos.$^{-1}$.

15182 Effect of Pressure on Ultrasonic Relaxation in Electrolytes. E. H. Carnevale and T. A. Litovitz. *Acoustical Society of America, Journal*, v. 30, July 1958, p. 610-613.

Measurements of the ultrasonic absorption and velocity were made on aqueous solutions of ammonia up to pressures of 2030 kg/cm^2. The results show that the absorption decreases and the relaxation frequency increases as the pressure is raised. The data are consistent with the assumptions of Eigen that the excess sound absorption is due to a chemical relaxation effect brought about by the lag in the shift in the equilibrium $NH_3 \cdot H_2O \rightleftharpoons NH_4^+ + OH^-$, and the rate of the reaction is diffusion controlled.

15183 Small Scale Acoustic Streaming Near a Locally Excited Membrane. Francis J. Jackson and Wesley L. Nyborg. *Acoustical Society of America, Journal*, v. 30, July 1958, p. 614-619.

Experiments are described involving a membrane set into oscillatory motion (40 kc) by contact with a vibrating tip of small area. Small scale acoustic streaming is observed in a liquid above the membrane, especially near the area of contact. Its character depends on the membrane tension.

15184* (Russian.) Conditions for the Existence of a Stigmatic Image in Electron Optical Systems Having a Curvilinear Axis. **Ob usloviiakh sushchestvovaniia stigmaticheskogo izobrazheniia v elektronnooptícheskikh sistemakh s krivolineĭnoĭ os'iu.** P. P. Kas'iankov. *Akademiia Nauk SSSR, Doklady*, v. 120, no. 3, 1958, p. 497-500.

Theoretical study of the basic trajectory of an axial pencil used as the axis of a curvilinear system of coordinates and application to the correction of the axial astygmatism caused by the elliptical opening of the objective in the electrostatic electron microscope.

15185* (German.) The Electrical Equivalent Circuit of Vibratory Piezoelectric Resonators. **Das elektrische Ersatzschema schwingender piezoelektrischer Kristallstäbchen.** Jan Tichý. *Annalen der Physik*, v. 1, nos. 4-5, May 1958, p. 219-231.

Formulas concerning the longitudinal, torsional, and flexural vibrations were derived. Effect of the external and internal damping and air gap between the electrodes and the vibrating crystal.

15186* (German.) Mobility of Positive Ions in Extremely Pure Gases and Gaseous Mixtures. **Über die Beweglichkeit positiver Ionen in extrem reinen Gasen und Gasgemischen.** R. Maushart. *Annalen der Physik*, v. 1, nos. 4-5, May 1958, p. 264-280.

Study of the mobility of positive ions of Ar-O, N-O, and N-O-water vapor mixtures under high-purity conditions. Types and modification of the ion complexes according to the mixture.

15187* Mobility of Gaseous Ions in Weak Electric Fields. Edward A. Mason and Homer W. Schamp, Jr. *Annals of Physics*, v. 4, July 1958, p. 233-270.

Kihara's extension of the Chapman-Enskog theory of transport phenomena is used to obtain the second order and third order approximations to the mobility of gaseous ions in a weak electric field as a function of temperature and field strength. In this method it is assumed that there is no charge exchange between ions and molecules, no clustering, and quantum effects can be neglected.

15188* On the Localization of the Energy of a Physical System in the General Theory of Relativity. C. Møller. *Annals of Physics*, v. 4, Aug. 1958, p. 347-371.

A consistent expression for the energy density of an arbitrary physical system is given inside the framework of the general theory of relativity. In contrast to usual beliefs it is thus possible to give a physical meaning to the localization of the energy in gravitational fields. For the total energy of closed physical systems, the new formulation gives the same values as the current theory, but the restriction to quasi-Galilean coordinates is not necessary any more.

15189** (English.) **Numerical Calculation of the Temperature Rise in Ignition by Hot Wires.** Henrik L. Selberg and C. H. Johansson. *Arkiv för Fysik*, v. 13, no. 5, 1958, p. 423-427.

The thermal conditions for a rapid rise in temperature in an explosive medium can in special cases be determined with satisfactory accuracy by analytical approximations to the solutions of the differential equations.

15190 Conference on Extremely High Temperatures. Heinz Fischer and Lawrence C. Mansur, editors. 258 pp. 1958. John Wiley & Sons, New York. (QC276 C76p Over.)

Twenty-two papers summarizing the underlying basis for commercial or usable thermonuclear reactions. Emphasis is on high temperatures as they relate to the propulsion fields.

15191 Temperature Dependence of Fluorescence of Tin-Activated Orthophosphates. Richard W. Mooney. *Electrochemical Society, Journal*, v. 105, Aug. 1958, p. 456-461.

Apparatus for measuring the temperature dependence of fluorescence is described. The variation of fluorescent intensity with temperature as a function of tin-activator concentration is given for the systems: strontium-zinc and strontium-calcium orthophosphate. In both cases, the quenching temperature is independent of activator concentration.

15192 Liberation of Electrons by Fast Neutral Helium Atoms From a Tungsten Target. H. W. Berry. *Journal of Applied Physics*, v. 29, Aug. 1958, p. 1219-1225.

The electron emission from W by bombarding He atoms of energy ranging from 300 to 3500 e.v. has been measured for a surface with less than a monolayer and with multilayers of adsorbed gas. The yield expressed in electrons per particle rises almost linearly from about zero at 300 e.v. to 0.42 electrons/particle at 3500 e.v. for a monolayer of adsorbed gas. Further adsorption of gas gives a much increased yield. These yields are compared with the ion under like conditions. The distributions of the normal velocity and a component of the tangential velocity are compared for the ion and neutral atom on hot and cold targets.

15193 Graphical Method for Estimation of Contrast in Electron Microscopy. P. Sadhukhan. *Journal of Applied Physics*, v. 29, Aug. 1958, p. 1235-1237.

A graphical method is described for estimating the contrast to be expected with different thicknesses of films of various metals, different aperture angles, and beam potentials.

15194* (French.) Study of ^{3}He by Means of Optical Spectroscopy at Lowest Temperature. **Étude des niveaux de ^{3}He par spectroscopie optique a très basse température.** J. Brochard, H. Chantrel, and P. Jacquinot. *Journal de Physique et le Radium*, v. 19, no. 5, May 1958, p. 515-522.

The hyperfine structure of ^{3}He and the isotope shift $\triangle$T(^{4}He - ^{3}He) is measured in specific lines.

15195* (French.) Piezoelectric Calculation of the Rate of Propagation. **Piézoelectricité calcul des vitesses de propagation.** M. Henri Pailloux. *Journal de Physique et le Radium*, v. 19, no. 5, May 1958, p. 523-526.

A mathematical study of the space and time variations of elastic strains, electric and magnetic fields, and polarization, in a general type of medium, piezoelectric but homogeneous, introducing Maxwell's relations which give a coupling.

15196 Propagation of Plane Electromagnetic Waves in Inhomogeneous Media. Harold Osterberg. *Optical Society of Amercia, Journal*, v. 48, Aug. 1958, p. 513-521.

The laws of propagation of plane electromagnetic waves along z are derived from Maxwell's equations for inhomogeneous media in which the dielectric constant and the electric conductivity are functions of z and in which the magnetic permeability is constant. The corresponding wave equation is reduced to a Ricatti differential equation. A simple method is evolved for treating this Riccati equation without approximation.

15197 Spectral Effects in Interferometry. G. D. Kahl and D. B. Sleator. *Optical Society of America, Journal*, v. 48, Aug. 1958, p. 525-530.

The influence on the fringe intensities of sources with known spectral energy density functions is analyzed both theoretically and experimentally for double beam interferometers of the Mach-Zehnder type. Simple relations between the spectrum and the fringe intensity and extent of the fringe field are presented.

15198 Improved, Single Flash, Continuum Source for Use Below 2000 A. Joseph A. Golden and Albert L. Myerson. *Optical Society of America, Journal*, v. 48, Aug. 1958, p. 548-550.

A high-intensity, low-energy flash lamp for use below 2000 A is described. The radiation from a single flash, at 4000 v and 15 mfd, produces an emission continuum to 1500 A which is of sufficient intensity to be used with either photographic or photomultiplier techniques.

15199 Radiation Received by an Uncollimated Receiver From a 4 π Source. Mathew G. Gibbons. *Optical Society of America, Journal*, v. 48, Aug. 1958, p. 550-555.

When both source and receiver are immersed in a uniform atmosphere, relative amounts of scattered visible radiation received are computed as a function of receiver acceptance angle for a range of receiver acceptance angles from 0 to 180°, and for types of atmospheric scattering which are characteristic of an extremely clear atmosphere, hazy atmosphere, and a murky atmosphere.

15200 Comparison Between Wave Optics and Geometrical Optics Using Fourier Analysis. II. Astigmatism, Coma, Spherical Aberration. Kenrô Miyamoto. *Optical Society of America, Journal*, v. 48, Aug. 1958, p. 567-575.

15201 Suppression Effect of the Ionization Produced by Electron-Positron Pairs of Extremely High Energy. Junji Iwadare. *Philosophical Magazine*, v. 3, no. 31, July 1958, p. 680-691.

Observations allow an independent estimate of the energy of the individual pair from the initial ionization, and for pairs with energy of about 300 b.e.v. most of the values thus obtained were in good accord with other results.

15202 Optical Constants, Heat Capacity and the Fermi Surface. M. H. Cohen. *Philosophical Magazine*, v. 3, no. 31, July 1958, p. 762-775.

Optical constants and the electronic heat capacity indicate that the Fermi surface is not spherical in Cu, Ag, Au, Li, Na, or K.

15203 Absorption and Refraction of Ammonia as a Function of Pressure at 6 mm Wavelengths. F. W. Heineken and A. Battaglia. *Physica*, v. 24, no. 7, July 1958, p. 589-603.

An apparatus is described to measure refractive indices and absorption coeficients of gases as a function of pressure up to one atmosphere at wavelengths of 12 and 6 mm. The method is based on the change in resonance frequency and quality factor Q of a cavity, filled with the gas of which the refraction and absorption are to be determined, compared to the resonance frequency and Q-value of a cavity filled with a reference gas (for example argon).

15204 Effect of Plastic Deformation on the γ-Ray Coloration of NaCl Crystals. A. S. Nowick. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 16-25.

Measurements are made at room temperature of the growth of the F-band in NaCl crystals. under γ irradiation in a Co^{60} source of constant intensity. Crystals of different origins, heat treatments, and states of deformation are examined.

15205 Effect of Fractional X-Irradiation of NaCl Crystals on *F*-Center Density. W. E. Bron and A. S. Nowick. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 26-27.

An attempt was made to verify an effect reported by Lin whereby the F-center density in an alkali halide crystal irradiated over only part of its cross section is proportional to the fraction of the crystal exposed to the X-ray beam. It was found that, within experimental error, the F-center density produced in a crystal exposed to a given intensity of X-rays for a given time is independent of the fraction of the crystal irradiated.

15206 Optical Transmission and Photoconductive and Photovoltaic Effects in Activated and Unactivated Single Crystals of ZnS. George Cheroff and Seymour P. Keller. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 98-102.

Certain physical properties of single crystals of ZnS and of ZnS activated with Mn, Cu, and Al have been determined. The optical studies involve transmission spectra. Photovoltages much larger than the energy gap have been measured. Reversals in the sign of the voltage have been measured as a function of the wavelength of incident light. The photovoltages and photocurrents have been determined as functions of wavelength and of intensity of incident light. A description is presented in which the characteristics of the crystals are treated as simple circuit elements.

15207 Reflection of Very Slow Electrons. H. A. Fowler and H. E. Farnsworth. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 103-112.

A monoenergetic electron beam from an electrostatic analyzer has been used to measure reflection coefficients of polycrystalline Pt, single-crystal Ge, and single-crystal Cu.

15208 Optical Absorption and Photoemission of Barium and Strontium Oxides, Sulfides, Selenides, and Tellurides. R. J. Zollweg. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 113-119.

Considerable structure has been observed at the intrinsic optical absorption edge of annealed films of BaO, BaS, BaSe, BaTe, SrO, SrS, SrSe, and SrTe at −160 C. Photoemission measurements allow an estimate to be made of the energy separation between the top of the valence band and the vacuum level.

15209 Refractive Index and Faraday Effect in Solid Solutions. D. L. Dexter. *Physical Review*, v. 111, ser. 2, no. 1, 1958, p. 119-124.

The change in the index of refraction and the magnitude of the Faraday effect are computed for non-metallic crystals (or solutions) containing impurities or color centers. Both effects are found to be easily measurable. A brief comparison with previous experimental and theoretical work is presented.

15210 Elastic and Piezoelectric Coefficients of Single-Crystal Barium Titanate. Don Berlincourt and Hans Jaffe. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 143-148.

Mechanical resonance and antiresonance frequencies were measured on barium titanate single-crystal elements maintained under electric d.c. bias from −50 to +150 C. A complete set of elastic, piezoelectric, and dielectric constants of the tetragonal modification at 25 C is obtained. The elastic compliances show substantial deviation from cubic symmetry. Measurements in the orthorhombic state show longitudinal compliance four times higher than in the tetragonal state.

15211 Two-Quantum Interaction Correction for the Ground-State Energy of the Helium Atom. Marian Günther. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 182-187.

A "frozen" potential representing mutual two-quantum interactions of two electrons is derived starting from the simplest nonrelativistic version of quantum electrodynamics. This potential is then used for calculating an energy correction for the ^1S state of the He atom with the help of wave functions of the Hylleraas type.

15212 Pressure Studies on the Nuclear Magnetic Resonance of Solid Hydrogen Between 1.2° and 14° K. G. W. Smith and C. F. Squire. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 188-193.

From work on solid H it was concluded that pressures up to several hundred atmospheres do not affect the rotation-libration transition at 1.5 K, but modest pressures produce sizable shifts of the self-diffusion transition at 10 K.

15213 Microwave Zeeman Effect and Theory of Complex Spectra. F. R. Innes and C. W. Ufford. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 194-202.

A treatment in spherical tensors of the microwave Zeeman interaction of Abragam, Kambe, and Van Vleck is given. A calculation of g factors in atomic O is then made and the numerical values compared with those worked out previously. New methods and results are developed for finding matrix elements of one-particle and two-particle operators for wave functions which contain more than one group of equivalent particles. The generality of these results is such that they may be used in the various coupling schemes of atomic and nuclear shell models.

15214 Precision Measurements of Millimeter and Submillimeter Wave Spectra: DCl, DBr, and DI. Monroe Cowan and Walter Gordy. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 209-211.

15215 Conservation Laws in General Relativity. J. N. Goldberg. *Physical Review*, v. 111, ser. 2, no. 1, July 1, 1958, p. 315-320.

15216 Proceedings of the Colloquium Spectroscopicum Internationale VI Held at Amsterdam in May 1956. W. Van Tongeren and F. Freese, editors. 663 pp. 1957. Pergamon Press, New York. (QC451 In8p)

The many papers include those on flame spectroscopy, emission spectrometry, arc and spark emission, emission instrumentation, absorption methods, ultraviolet and infrared spectroscopy.

15217* A General Theory of Magnetic Resonance Saturation. Kazuhisa Tomita. *Progress of Theoretical Physics*, v. 19, no. 5, May 1958, p. 541-580.

15218 Direct Quartz Crystal Control of a Low-Level Pound-Knight-Watkins Spin Magnetometer. Richard J. Blume. *Review of Scientific Instruments*, v. 29, July 1958, p. 574-577.

A quartz crystal is placed in the feedback path of the marginal oscillator, between the cathodes of the oscillator tubes. This change results both in greatly improved frequency stability and a useful increase of signal-to-noise ratio (although not necessarily of noise figure) owing to the R.F. filtering action of the crystal. Magnetometer operation at an R.F. level as low as 100 μv across the sample coil, equivalent to an R.F. field of about 5 μgauss has been obtained. A magnet servo based on the crystal-controlled magnetometer is discussed.

15219* (Italian.) Determination of the Molecular Weight Distribution by Brownian Diffusion and Sedimentation Measurements. **Un metodo per determinare la distribuzione delle masse molecolari in un campione polimerico attraverso misure di diffusione browniana di sedimentazione.** Alberto Ciferri and Michel Daune. *Ricerca Scientifica*, v. 28, no. 3, Mar. 1958, p. 507-516.

Method can be used, under certain conditions, even if a polydispersity of shape exists.

15220 Magnetic Resonance. George E. Pake. *Scientific American*, v. 199, no. 2, Aug. 1958, p. 58 + 7 pages.

Use of magnetic fields to tip over spinning atomic nuclei and electrons. The technique furnishes much information about complex molecules and chemical reactions. Use of magnetometer to explore the earth's magnetic field.

15221 Theoretical Physics; Thermodynamics, Electromagnetism, Waves, and Particles. F. Woodbridge Constant. 364 pp. 1958. Addison-Wesley Publishing Co., Reading, Mass. (QC20 C76t)

Book is for the upperclassman or the beginning graduate student.

15222 Thermodynamics of Heat—Power Systems. F. W. Hutchinson. 490 pp. 1957. Addison-Wesley Publishing Co., Reading, Mass. (TJ265 H97t)

For an introductory thermodynamics course offered to engineers of thermodynamics as the study of energy (particularly in its thermal and mechanical manifestations) as it follows a path from source to utilization.

15223 A Three-Stage Research Mass Spectrometer. F. A. White, F. M. Rourke, and J. C. Sheffield. *U. S. Atomic Energy Commission, KAPL-1843*, May 28, 1958, 53 pp. (UF767 Un3.1ka Contin.)

A three-stage mass spectrometer that utilizes two consecutive magnetic focusing lenses of 20-in. radii followed by a 20-in. radius-of-curvature electrostatic analyzer is described. An abundance sensitivity of 10^{10} was measured for this instrument in the low mass region. Application of this instrument to analyti-

cal and research problems in the field of mass spectrometry and the results obtained are discussed.

15224 Comparison of Theoretical and Experimental Filtered X-Ray Spectra. J. C. Villforth, R. D. Birkhoff, and H. H. Hubbell, Jr. *U. S. Atomic Energy Commission, ORNL-2529*, July 15, 1958, 77 pp. (UF767 U3o Contin.)

Spectral distributions of filtered X-ray beams were taken for six X-ray tube voltages from 30 to 250 k.e.v. with a sodium iodide scintillation spectrometer. The spectrometer was calibrated for energy response and resolution with γ-rays and K X-rays from radioactive isotopes as well as K X-rays from fluorescent radiators.

15225 The Slowing-Down Distribution of Energetic Nuclei in a Fully Ionized Gas. Ray E. Kidder. *U. S. Atomic Energy Commission, UCRL-5212*, May 6, 1958, 11 pp. (UF767 U3u Contin.)

With reference to thermonuclear reactions, the results obtained suggest that in some situations the contribution of the slowing-down distribution to the reaction rate may be significant.

15226 Energy Transfer Between Charged Particles by Coulomb Collisions. Ray E. Kidder. *U. S. Atomic Energy Commission, UCRL-5213*, May 12, 1958, 21 pp. (UF767 U3u Contin.)

The theory of energy transfer between charged particles in a fully ionized gas is reviewed, and calculations are made of the rate at which energy is transferred from electrons at a temperature T to cooler ions (taken to be at rest). Suggestions are made for improvements of the theory of Coulomb interactions in ionized gases.

15227 Stability of the Interface Between Two Immiscible Liquids of Unequal Viscosity in a Porous Solid. Ray E. Kidder. *U. S. Atomic Energy Commission, UCRL-5214*, May 7, 1958, 7 pp. (UF767 U3u Contin.)

Conditions for stability are derived and the rate of growth of instabilities of specified wavelength is obtained. The expression for the rate of growth of instability is similar in form to that obtained by Taylor for the case of uniformly accelerated incompressible liquids, but the growth rate is found to be inversely proportional to the wavelength rather than inversely proportional to the square root of the wavelength.

15228* (Russian.) Quantum Theory of Kinetic Phenomena in Semiconductors. **Kvantovaia teoriia kineticheskikh iavlenii v poluprovodnikakh.** A. G. Samoilovich and L. L. Korenblit. *Zhurnal Tekhnicheskoĭ Fiziki*, v. 27, no. 12, Dec. 1957, p. 2673-2697.

Theoretical study.

15229* (Russian.) Recombination on Three Levels of Copper Atoms in Germanium Considering the Statistics of Their Filling With Electrons. **O rekombinatsii na trekh urovniakh atomov medi v germanii s uchetom statistiki ikh zapolneniia elektronami.** T. V. Mashovets. *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 6, June 1958, p. 1140-1150.

Investigation of the effect of the "usual" thermal treatment on the recombination, the "thermocenters" being Cu atoms in hard solution of substitution. Evaluation of the size of the sections of the recombination of electrons and holes in the additional levels formed by other atoms.

15230* (Russian.) Mechanism of Conductivity and Photoconductivity in Polycrystalline Layers of Semiconductors of the PbS Group. **K voprosu o mekhanizme provodimosti i fotoprovodimosti v polikristallicheskikh sloiakh poluprovodnikov gruppy PbS.** B. T. Kolomiets and V. N. Larichev. *Zhurnal Tekhnicheskoĭ Fiziki*, v. 28, no. 6, June 1958, p. 1358-1362.

A study of the effects of the electrical and photoelectrical properties of the polycrystalline layers of PbS, PbSe, and PbTe. Relationship between the resistance and thermo-e.m.f. of layers of PbSe according to various O contents.

See also: **14739** (diffusion of gases, liquids, and solids in solids, bibliography); **14746** (bibliography on surface tension).

PLASTICS

15231* Plastic Pipe. Harold M. Englund. *Air Conditioning, Heating, and Ventilating*, v. 55, Aug. 1958, p. 67-78.

Characteristics and applications of four principal types: PVC, polyethylene, acrylonitrile - butadiene - styrene, and cellulose acetate butyrate.

15232* (Russian.) The Cell Effect and the Thermal Stability of Polymers. **Effekt kletki i termostabil'nost' polimerov.** B. A. Dolgoplosk, B. L. Erusalimskiĭ, E. B. Milovskaia, and G. P. Belonovskaia. *Akademiia Nauk SSSR, Doklady*, v. 120, no. 4, June 1, 1958, p. 783-785.

In order to increase the thermal stability of carbon chain polymers in a vitrified state, one must raise their temperature of fusion. In gum-like polymers for which the cell effect is lower, high thermal stability can be obtained because of the stability of the bonds of the basic chain.

15233* Health Hazards and Control of an Epoxy Resin Operation. W. H. Kingsley. *American Industrial Hygiene Association Journal*, v. 19, no. 3, June 1958, p. 258-260.

Details of Sandia Corporation's solution to this problem

15234 The Low-Temperature Brittleness Testing of Polyethylene. P. N. Bestelink and S. Turner. *ASTM Bulletin*, 1958, no. 231, July 1958, p. 68-73.

A new apparatus and subsidiary equipment.

15235* Enter Fiber-Polymer Structures. Norman L. Greenman. *Astronautics*, v. 3, Aug. 1958, p. 25.

Problems of re-entry bodies and boosting vehicles demand new thinking in terms of materials. In the area of non-metals, fiber-polymer structures, deposited with great uniformity from water dispersions, may find a use in nose cones and wing leading edges.

15236* Plastics for Liquid Rocket Engines. Ernest J. Zeilberger. *Astronautics*, v. 3, Aug. 1958, p. 26 + 5 pages.

Properties and applications are discussed.

15237 Plastics—Drive Ahead in Automotive Field. II. Andrew W. Shearer. *Automotive Industries*, v. 119, no. 3, Aug. 1, 1958, p. 42 + 7 pages.

Some of the numerous applications for thermoplastics in automobiles.

15238 Fluorocarbon Plastics Take on New Jobs. R. B. Norden. *Chemical Engineering*, v. 65, Aug. 11, 1958, p. 158 + 2 pages.

Modified compositions and improved fabrication techniques promise much wider process use of chemically-resistant fluorocarbon plastics.

15239 Soluble Catalyst Helps Properties. *Chemical and Engineering News*, v. 36, no. 29, July 21, 1958, p. 56.

Improved linear polyethylene can now be made by using catalysts soluble in the reaction medium. Research using the reaction product of *bis*(cyclopentadienyl)titanium dichloride with diethylaluminum chloride as the catalyst is reported.

15240* (Czech.) Dependence of the Rate of Polymerization of Isobutylene on the Acidity of the Catalyst. **Závislost polymeračnĭ rychlosti *iso*butylenu na kyselosti katalysátoru. II.** Catalysis by Binary Systems: BF_3-H_2O and H_2SO_4-H_2O. **Katalysa binárními soustavami BF_3-H_2O a H_2SO_4-H_2O.** Oto Wichterle, Miloslav Kolínský, and Miroslav Marek. *Chemické Listy*, v. 52, no. 6, June 1958, p. 1049-1057.

15241* Polythene Pipe as a Permanent Under-Sea Installation. *Corrosion Prevention & Control*, v. 5, no. 7, July 1958, p. 56-58.

Three miles of Polythene pipe is used for a new pneumatic breakwater that has recently been given a successful try-out.

15242 The Effects of Ionizing Radiation on Natural and Synthetic High Polymers. Frank A. Bovey. 587 pp. 1958. Interscience Publishers, Inc., New York. (QD601 B66e)

A critical review of the most significant basic research, most of it very recent. A compact summary of our present knowledge.

15243 Extrusion of Plastics. E. G. Fisher. 114 pp. 1958. Interscience Publishers, New York. (TP986.A2 F53e)

All phases of the extrusion of plastics, from both the practical and theoretical viewpoints, with the more important features treated in greater detail. Also covers the various types of extrusion machines, constructional features, materials for extrusion, and the complete extrusion process.

15244 Polymerization of Allylic Methacrylates. II. Substituted Allyl Methacrylates. G. M. Bristow. *Faraday Society, Transactions*, v. 54, pt. 7, July 1958, p. 1064-1068.

The method described in part I for the determination of the relative reactivity of the two monomeric groups in a bifunctional monomer, was applied to α-methallyl, β-methallyl, γ-methallyl (crotyl), β-chlorallyl, and allyl carbinyl methacrylates.

15245* (German.) The Ultrasonic Polymerization of Acrylonitrile. **Über die Ultraschallpolymerisation von Acrylnitril. II.** Acceleration of the Polymerization by the Addition of Reducing Agents. **Polymerisationsbeschleunigung durch Zugabe von Reduktionsmitteln.** Kurt Edelmann and Rosemarie Klemmt. *Faserforschung und Textiltechnik*, v. 9, no. 5, May 1958, p. 185-188.

By addition of thiosulfate to the peroxide compounds, formed in the ultrasonic field, an essential acceleration of the polymerization is achieved.

15246* Sulphur-Containing Nylon Derivatives. Christopher Earland. *Fibres*, v. 19, July 1958, p. 212-213.

Discusses the production of nylon derivatives containing monosulfide and disulfide groups, and their chemical characteristics.

15247 Preparation, Homopolymerization, and Copolymerization of Alpha-Acyloxyacrylic Esters. Thomas M. Laakso and Cornelius C. Unruh. *Industrial and Engineering Chemistry*, v. 50, Aug. 1958, p. 1119-1123.

15248 Syntheses of Metal-Complexing Polymers. I. Phosphorylated Polymers. J. Kennedy, E. S. Lane, and B. K. Robinson. **II. Phosphonamide and α-Aminophosphonate Polymers.** J. Kennedy and G. E. Ficken. *Journal of Applied Chemistry*, v. 8, pt. 7, July 1958, p. 459-468.

15249 Neighbor Interactions and Internal Rotations in Polymer Molecules. I. Stereospecific Structure and Average Dimensions. Shneior Lifson. *Journal of Chemical Physics*, v. 29, July 1958, p. 80-88.

The skeletal bonds of vinylic polymer molecules are classified as (+) and (−) bonds according to the arrangement of the side groups relative to the bonds. The detailed structure of isotactic and syndiotactic polymers is characterized by the different regularities of arrangement of these two bond types along the molecular chain. Symmetry properties are discussed.

15250 Pyrolysis of Poly-α-Methylstyrene. Daniel W. Brown and Leo A. Wall. *Journal of Physical Chemistry*, v. 62, July 1958, p. 848-852.

The rates of volatilization and decrease in degree of polymerization have been measured for fractions of poly-α-methylstyrene.

15251* (French.) Synthesis of Graft Copolymers From Polymers Submitted to Ionizing Radiation. **Synthèse des copolymères greffés a partir des polymères ayant subi l'action des radiations ionisantes. I.** General Characteristics of the Grafting Reaction of Preirradiated Polyethylene. **Caractères généraux de la réaction de greffage sur le polyéthylène préirradié.** Adolphe Chapiro. *Journal of Polymer Science*, v. 29, June 1958, p. 321-342.

When polyethylene is irradiated in the presence of air, peroxydic crosslinks are formed besides the formation of polymeric networks. These peroxydic crosslinks were used for preparing graft copolymers.

15252* Aromatic Polyanhydrides, a New Class of High Melting Fiber-Forming Polymers. Andre Conix. *Journal of Polymer Science*, v. 29, June 1958, p. 343-353.

Preparation, general properties, and influence of chemical structure on the physical properties of polyanhydrides derived from dibasic aromatic acids.

15253* Particle Size and the Rate of Emulsion Polymerization. A Comparison of Results Obtained by Electron Microscopy and Light Scattering. G. M. Burnett, R. S. Lehrle, D. W. Ovenall, and F. W. Peaker. *Journal of Polymer Science*, v. 29, June 1958, p. 417-423.

The number of particles in an emulsion latex was determined using standard light scattering apparatus. The values determined are shown to agree closely with those observed using electron microscopy either by direct count methods or by measurement of the dimensions of the particles.

15254* (German.) Ultrasonic Polymerization of Acrylonitrile. **Über die Ultraschall-Polymerisation von Acrylnitril.** Kurt Edelmann. *Journal of Polymer Science*, v. 29, June 1958, p. 531-539.

Concentrated acrylonitrile solutions in dimethylformamide were mixed with various amounts of water and ultrasonic waves applied. The ultrasonic waves split water molecules into H- and OH-radicals, and the OH-radicals initiated the progressive polymerization of acrylonitrile.

15255* Influence of the Solvent on the Polymerization Velocity of Trifluorochloroethylene. M. Lazar. *Journal of Polymer Science*, v. 29, June 1958, p. 573-578.

The influence of carbon tetrachloride, pentachloroethane, 1,2-dichloroethane, 1,1,2-trifluorotrichloroethane, benzene, and 1,3,5-trimethylbenzene on the velocity of the benzoyl peroxide-initiated polymerization of trifluorochloroethylene was studied over a wide range of concentrations.

15256 Chain Transfer in Solution Polymerization: IV. Acrylates & Methacrylates. S. L. Kapur and S. D. Gadkary. *Journal of Scientific & Industrial Research*, v. 17, sec. B, Apr. 1958, p. 152-155.

Studies in the presence of a few chlorinated solvents show that both Cl and H atoms take part in the chain transfer reaction and the contribution of each depends on the nature of the solvent and the growing monomer radical.

15257 The Kinetics of Vinyl Polymerization by Radical Mechanisms. C. H. Bamford, W. G. Barb, A. D. Jenkins, and P. F. Onyon. 318 pp. 1958. Academic Press, New York. (QD281.P6 B21k)

A balanced account of theoretical and experimental foundations.

15258* (German.) Polyethylene. **Polyäthylen.** Adolf Schwarz. *Kunststoffe*, v. 48, July 1958, p. 292-298.

Various grades of polyethylene having varying degrees of cross linking are discussed in the light of present-day knowledge regarding the relationship between structure, crystallinity, and properties.

15259* (German.) Recent Developments in the Fabrication and Processing of Rigid Polyethylene Semi-Finished Materials. **Weiterentwicklung der Verarbeitung von Halbzeugen aus Hart-Polyäthylen.** E. Rottner. *Kunststoffe*, v. 48, July 1958, p. 345-348.

15260* The Effect of Pressure and Molecular Weight Upon the Viscosity of Polybutenes. L. B. Sargent, Jr. *Lubrication Engineering*, v. 14, no. 7, July 1958, p. 298 + 4 pages.

Average molecular weights of polybutene blends do not fully reveal the true nature of their viscosity properties. Polybutene blends consisting of components having widely different molecular weights behave, with regard to viscosity, as though their average molecular weights are lower than measurements reveal. Both the average molecular weight and the molecular weight distribution of a polybutene are important in predicting viscosity behavior.

15261 Reinforced Plastics Pipe Progress. H. D. Boggs. *Modern Plastics*, v. 35, no. 12, Aug. 1958, p. 96 + 7 pages.

High working pressures and service temperatures, light weight, and corrosion resistance of reinforced plastics pipe bring substantial savings in many applications. Business as well as technical aspects are discussed.

15262 Reinforced Molding With Acrylic Sirup. John A. Ross, Brian Mead, and John T. Rundquist. *Modern Plastics*, v. 35, no. 12, Aug. 1958, p. 109 + 4 pages.

All-acrylic laminating resin can be used to make such glass-reinforced products as corrugated, flat decorative, and structural sheet, furniture, and other complex shapes. Structures made with this new resin have excellent resistance to weathering. Effects of process variables on quality and methods for controlling quality are discussed.

15263 Evaluation of Carbon Black Dispersions in Polyethylene to Predict Weatherability. Roger M. Schulken, Jr., Gordon C. Newland, and John W. Tamblyn. *Modern Plastics*, v. 35, no. 12, Aug. 1958, p. 125 + 5 pages.

A procedure based on the use of a Photovolt transmission densitometer was developed for evaluating the degree of dispersion of carbon black in polyethylene films. Good correlation was found between the weathering resistance and the white-light absorptivity of such films.

15264 Creep and Stress-Rupture Behavior of Rigid PVC Pipe. II. J. H. Faupel. *Modern Plastics*, v. 35, no. 12, Aug. 1958, p. 132 + 4 pages.

Discusses test results and their interrelations on the basis of existing theory.

15265 Fracture Markings in Polymethyl Methacrylate. D. C. Smith. *Nature*, v. 182, July 12, 1958, p. 132-133.

New evidence was obtained of the importance of secondary microcracks in fracture behavior and patterning in polymethyl methacrylate.

15266 Physical Chemistry of High Polymers. Maurice L. Huggins. 175 pp. 1958. John Wiley & Sons, Inc., New York. (QD281.P6 H87p)

Extends the concepts of classical physical chemistry to systems containing large molecules. Describes the molecular structures of synthetic and natural high polymers. Emphasis is on fundamental principles and on the explanation of properties in terms of molecular structure.

15267* (Polish.) The Resistance of Moldings From Urea and Melamine Molding Powders. **Odporność wyprasek z tłoczyw mocznikowych i melaminowych na czynniki zewnętrzne.** Jan Brzeziński and Zygmunt Wirpsza. *Przemysł Chemiczny*, v. 37, no. 5, May 1958, p. 361-364.

The resistance and change in properties of moldings from Polish urea and melamine molding powders were examined at different temperatures in wet and dry conditions.

15268* (Polish.) Polyamides—A New Type of Epoxy Resin Hardener. **Poliamidy—nowy typ utwardzaczy żywic epoksydowych. I.** Preparation and Properties of Polyamides. **Otrzymywanie i własności poliamidów.** Stanisław Penczek. *Przemysł Chemiczny*, v. 37, no. 5, May 1958, p. 365-369.

The following processes were worked out on a laboratory scale: preparation of methyl esters of fatty acids of linseed oil, their polymerization, and the preparation of dimerized esters. Several polyamides were prepared from dimerized methyl esters of fatty acids and di- and polyamines. The dependence of softening points and amine numbers of polyamides on the type of amine used and the molar ratio of diester to di- or polyamine was examined.

15269 Factors Affecting the Formability of Extruded Sheet Plastics. E. L. Williams and T. R. Twitchett. *Rubber and Plastics Age*, v. 39, July 1958, p. 575-576.

15270* Intensive Mixing. W. R. Bolen and R. E. Colwell. *SPE Journal*, v. 14, Aug. 1958, p. 24-28.

Intensive mixing will usually be accompanied by extensive mixing. Consideration is restricted here to a process in which intensive mixing is rate controlling.

15271* Internal Strains in Casting Resins. R. N. Sampson and J. P. Lesnick. *SPE Journal*, v. 14, Aug. 1958, p. 33-35.

New method of stress study provides design data for electronic embedments and makes possible the development of improved resin compositions.

15272* The Effect of Plastics on Bacteria. W. G. Walter, B. Beadle, R. Rodriguez, and Dorothy Chaffey. *SPE Journal*, v. 14, Aug. 1958, p. 36 + 2 pages.

Selection of materials for milk sample containers is aided by a study of the effects of 23 different plastics on bacteria encountered in milk.

15273 The Chemistry of the Cross-Linking of Polyurethanes. Milton Orchin, Heinz Schulze, Charles Reilly, and Margie R. Huey. *U. S. Air Force, Wright Air Development Center, WADC Technical Report* 58-100, Jan. 1958, 17 pp. (TL507 Un3.18w Vis.)

Work was begun with a study of the reactions of amines, alcohols, and carboxylic acids with isocyanates and extended to reactions of isocyanates with ureas, urethanes, and other compounds with active H. Simultaneously, dissociation reactions of ureas and carbamates were investigated. The main effort was devoted to a rate study of the reactions of substituted phenylcarbanilates with amines.

15274* (German.) The Structure of Glow Discharge Polymerizates Under Different Conditions of Formation and Its Modification by Means of Electron Radiation. **Der Aufbau von Glimmentladungs-Polymerisaten verschiedener Entstehungsbedingungen und seine Veränderung durch Elektronenbestrahlung.** Andreas Brockes and Hans König. *Zeitschrift für Physik*, v. 152, no. 1, 1958, p. 75-86.

The polymerizates produced in a benzene or methane glow discharge show some structural similarities with electron-radiated organic supporting films. Effects of the different structures of polymerizates on the mechanical properties owing to electron microscope investigation of contour replicas of ZnO needles and their deformation are discussed.

15275* (Russian.) The Temperature Dependence of the Mechanical Breakdown Rate of High Polymers. **Temperaturnaia zavisimost' skorosti mekhanicheskoĭ destruktsii vysokopolimerov.** N. K. Baramboĭm. *Zhurnal Fizicheskoi Khimii*, v. 32, no. 6, June 1958, p. 1248-1251.

Other conditions being constant, the temperature dependence of the rate of mechanical breakdown of polymers was found to be determined by their physical state. The temperature coefficient of the rate is a negative quantity and for vitreous polymers is practically zero.

15276* (Russian.) Determination of the Rate Constants of the Elementary Reactions of Methylacrylate Polymerization. **Opredelenie konstant skorosteĭ elementarnykh reaktsii polimerizatsii metilakrilata.** Z. A. Sinitsyna and Kh. S. Bagdasar'ian. *Zhurnal Fizicheskoĭ Khimii*, v. 32, no. 6, June 1958, p. 1319-1327.

The initial rate of polymerization of methylacrylate under the action of dinitrilazodiisobutyric acid was investigated, and the length of the molecular chains formed were measured. Determination was made of the mean life of kinetic chains by the rotating segment and the rate of initiation by the diphenylpicrylhydrazyl methods.

15277* (Russian.) Zinc Organic Compounds, the Catalysts of Propylene Polymerization. **Tsinkorganicheskie soedineniia—katalizatory polimerizatsii propilena.** G. A. Razuvaev, L. M. Bobinova, and V. S. Etlis. *Zhurnal Obshcheĭ Khimii*, v. 28, no. 6, June 1958, p. 1623-1626.

Activity of diethyl zinc catalyst with addition of $TiCl_4$ in propylene polymerization. Optimum conditions for the production of hard polypropylene.

15278* (Russian.) Internal Rotation in Polymer Chains and Their Physical Properties. **Vnutrennee vrashchenie v polimernykh tsepiakh i ikh fizicheskie svoistva. VI.** Sizes and Dipole Moments of Polyvinyl Chains With Massive Side-Chains. **Razmery i dipol'nye momenty polivinilovykh tsepeĭ s massivnymi priveskami. VII.** Configuration of Polymer Chains in Crystalline State and in Solution. **Konfiguratsiia polimernykh tsepeĭ v kristallicheskom sostsianii i v rastvose.** O. B. Ptitsyn and Iu. A. Sharenov. *Zhurnal Teknicheskoĭ Fiziki*, v. 27, no. 12, Dec. 1957, p. 2744-2773.

See also: **14375** (phenolic resin chemistry); **14454** (moisture vapor transmission testing); **14609** (automatic molding); **15292** (benzene diffusion in polythene).

POLLUTION AND WASTES

15279* The Deposition of a Submicronic Aerosol in the Respiratory Tract of Dogs. P. E. Morrow and F. R. Gibb. *American Industrial Hygiene Association Journal*, v. 19, no. 3, June 1958, p. 196-200.

An increase in deposition was associated with an increase both in the mean tidal volume and in the mean inspiratory air flow and with a decrease in the mean respiratory frequency. This study suggests that under the proper experimental conditions, aerosol deposition in the dog is comparable to that occurring in man.

15280* Studies on Smog Produced in Irradiated Reaction Chambers. R. W. Shortridge, F. V. Morriss, C. C. Bolze, and E. E. Harton, Jr. *American Industrial Hygiene Association Journal*, v. 19, no. 3, June 1958, p. 213-217.

Concludes that motor car exhaust produces both the oxidant and the eye irritation manifestations; sunlight is necessary for this effect and olefins produce more eye irritation than do paraffins.

15281 Appraisal of Air Pollution in Tennessee. Paul A. Kenline. 85 pp. 1957. U. S. Department of Health, Education, and Welfare, Washington, D. C. (Pamphlet File)

15282* (French.) The Treatment of Residual Waters From a Metallurgical Processing Plant. **Traitement des eaux residuaires du travail des metaux.** G. Allais. *Corrosion et Anticorrosion*, v. 6, nos. 7-8, July-Aug. 1958, p. 252-257.

15283 Air and Water Pollution in the Iron and Steel Industry. A. Parker. *Iron and Steel Institute, Journal*, v. 189, pt. 4, Aug. 1958, p. 297-302.

Legislative requirements for pollution control are explained and attention is drawn to improvements that have been made during recent years, to investigations in progress, and to the difficulties still to be overcome.

15284* Radioactive Fallout. W. F. Libby. *National Academy of Sciences, Proceedings*, v. 44, Aug. 1958, p. 800-820.

Reviews recent data, particularly on bomb carbon-14, together with earlier data on bomb fission products and tritium, and discusses the present understanding of the fallout mechanism.

15285* (German.) Radiocarbon Produced in the Atmosphere by Atomic Explosions. **Durch Atomexplosionen erzeugter Radiokohlenstoff in der Atmosphäre.** K. O. Münnich and J. C. Vogel. *Naturwissenschaften*, v. 45, no. 14, July 1958, p. 327-329.

15286 Variations in the Design of Plating Waste Treat Systems. Robert Dvorin. *Plating*, v. 45, Aug. 1958, p. 827-831.

15287 Long-Term Fallout. Merril Eisenbud and John H. Harley. *Science*, v. 128, Aug. 22, 1958, p. 399-402.

A summary of measurements made through June 1957 by the gummed-film network of the AEC is presented. The range of values for Sr^{90} deposition through June 1957 in the U. S. is 11 to 54 millicuries per sq. mile, which is somewhat higher than other large land areas of the world. Excluding the U. S., deposition in the Northern Hemisphere averages 16 millicuries per sq. mile, about twice the average for values reported in the Southern Hemisphere.

15288 The Accumulation of Radioactive Fallout on Typical Materials of Construction. F. P. Cowan. *U. S. Atomic Energy Commission, BNL*-497, Mar. 1958, 8 pp. (UF767 Un3.1bn Contin.)

15289 Progress Report. Electronoscopic Particle Studies. R. Borasky. *U. S. Atomic Energy Commission, HW*-55172, May 1, 1958, 15 pp. (UF767 Un3.1hw Contin.)

Presents electronoscopic observations and size distribution data of particles collected from aerosols containing $Sr^{90}SO_4$, $Ru^{106}O_2$ or $Pu^{239}O_2$.

15290 Fifth Atomic Energy Commission Air Cleaning Conference Held at the Harvard Air Cleaning Laboratory June 24-27, 1957. *U. S. Atomic Energy Commission, TID*-7551, Apr. 1958, 159 pp. (UF767 Un3ti Contin.)

This report represents a compilation of papers presented during the last two days of the Fifth AEC Air Cleaning Seminar to discuss and evaluate operations, problems, and new developments in the field. Operational experiences in the processing of gasous effluents from fuel fabrication plants, in reactor facilities, and in other AEC National Laboratory and contractor activities were related.

See also: **14226** (radioactive fallout); **14275** (water purification of organic substances); **14683** (natural aerodynamics); **14756** (bibliography on metal finishing wastes); **15176** (atmospheric pollution).

RUBBER AND ELASTOMERS

15291 Melting Range of Rubber Chemicals. *ASTM Bulletin*, 1958, no. 231, July 1958, p. 92-96.

A statistical study of melting range as a criterion for evaluation of several technical-grade rubber chemicals.

15292 Diffusion of Benzene in Rubber and Polythene. R. M. Barrer and R. R. Fergusson. *Faraday Society, Transactions*, v. 54, pt. 7, July 1958, p. 989-1000.

An account of solution and diffusion of benzene in a natural rubber vulcanizate and in polythene. Measurements were made of steady-state permeation rates as well as of time-lags.

15293* Branching in Macromolecules of Different Synthetic Rubbers. I. Ya. Poddubnyi and E. G. Ehrenburg. *Journal of Polymer Science*, v. 29, June 1958, p. 605-619.

The influence of polymerization temperature on degree of branching in various synthetic rubbers was determined. The effect on the degree of branching of rubber macromolecules prepared in the presence of Na, K, and Li depends largely on the metal employed.

15294 Silicone Rubber Sponge. James C. Walton. *Product Engineering*, v. 29, no. 31, Aug. 4, 1958, p. 54-55.

Now, with better sponging grades, sharper process controls, and special reinforcing techniques, tolerances can be predicted and rejects decreased.

15295* (French.) Adhesive Tapes: Their Characteristics and Controls. **Les rubans adhésifs leurs caractéristiques, leurs contrôles.** J. Dubuit. *Revue Générale du Caoutchouc*, v. 35, no. 6, June 1958, p. 757-763.

The adhesive content of a tape includes an elastomer, resins, plastifiers, mineral fillers, and an antioxidant. Control tests used include: the measurement of elastomer plasticity, adhesive viscosity control, and control of stickiness. Quality control includes the measurement of adhesive power and accelerated aging, strength, and moisture permeability tests.

15296 The Rheology of Elastomers. P. Mason and N. Wookey, editors. 202 pp. 1958. Pergamon Press, New York. (TS1871 B77r)

Includes the contributed papers and discussions of a conference organized by the British Society of Rheology. A collection of specialist articles giving the up-to-date position on various aspects of the deformation and flow properties of elastomers.

15297* The Role of High Polymers in Composite Solid Rocket Fuels. John M. McDermott. *Rubber Age*, v. 83, no. 5, Aug. 1958, p. 807-811.

The basic process currently in use in the preparation of rubbery-rocket-fueled engines is described.

15298* Polyurethane Foams. Stability, Collapse, Shrinkage. H. K. Frensdorff. *Rubber Age*, v. 83, no. 5, Aug. 1958, p. 812-818.

A study of physical factors affecting foaming behavior with conclusions on the effects of silicone additives and shrinkage produced by CO_2 diffusion.

15299* Flame Resistance of Neoprene. Effects of Compounding Ingredients. D. C. Thompson, J. F. Hagman, and N. N. Mueller. *Rubber Age*, v. 83, no. 5, Aug. 1958, p. 819-824.

A new method for testing the combustibility of elastomers was used. Of the various ingredients tested, a hydrated alumina was found to impart the greatest degree of flame resistance to neoprene.

15300* Rubber Molding Techniques and Equipment. G. C. Hessney. *Rubber Age*, v. 83, no. 5, Aug. 1958, p. 825-826.

Compression, molding, transfer molding, and injection molding; presses for molded rubber parts; mold design.

15301 Rubber in Astronautics. H. N. Langton and S. N. Angove. *Rubber Journal and International Plastics*, v. 135, no. 2, July 12, 1958, p. 41 + 3 pages.

The principles of rocket design are first reviewed followed by a discussion of the possible applications of rubber in this new field. (To be continued.)

15302 Curing of Silicone Rubbers. C. J. Baker and I. H. Riley. *Rubber and Plastics Age*, v. 39, July 1958, p. 577 + 2 pages.

Considers curing by organic peroxides, sulfur, condensation, or by high-energy radiation.

15303* Halogenation of Butyl Rubber With Iodine Monochloride and Iodine Monobromide. R. T. Morrissey. *Rubber World*, v. 138, no. 5, Aug. 1958, p. 725 + 8 pages.

Combinations of Cl or Br in the form of iodine monochloride and iodine monobromide serve to modify butyl rubber in much the same manner as Br alone. The ICl and IBr butyls show, as in the case of brominated butyl, several properties superior to those of butyl, among which are better covulcanization with natural rubber, greater resistance to ozone, and increased adhesion to natural rubber and metals.

15304* Economics of Flexible Urethane and Latex Rubber Foams. Peter B. Baker. *Rubber World*, v. 138, no. 5, Aug. 1958, p. 733-737.

Present material costs for flexible urethane foams are higher than for latex foams on a board-foot basis. It is probable that declines in raw material prices in the future will bring material costs for the two processes approximately into balance. Urethane foam technology is in an early stage of development, and the inherent chemical versatility of the material points to the possibility of developing unique products for markets which presently do not use foams.

15305* Silicone Rubber Reclaim. B. R. Wendrow and D. P. Spalding. *Rubber World*, v. 138, no. 5, Aug. 1958, p. 738-742.

Data regarding the properties of silicone reclaim and suggestions on the efficient and proper use of such material.

SPACE HEATING AND CONDITIONING

15306* Rapid Design of High Velocity Ducts. Elliot Godes. *Air Conditioning, Heating, and Ventilating*, v. 55, Sept. 1958, p. 73-87.

A simple and flexible 14-step method for designing the high velocity ducting that serves the all-air high velocity heating and air conditioning system.

15307* Designing for Welded Systems of Small Size Pipe. A. N. Kugler. *Air Conditioning, Heating, and Ventilating*, v. 55, Sept. 1958, p. 89-91.

Because small diameter pipe involves problems peculiar to size, it is necessary to design specially for these conditions. It is important to organize the job on the basis of the small pipe to achieve maximum economy.

15308* The Peltier Effect. John Kronsbein and W. O. Hartsaw. *Refrigerating Engineering*, v. 66, Sept. 1958, p. 31 + 3 pages.

Possibilities for use in refrigerator systems. Basic phenomenon of the Peltier effect is the heating of one of two junctions and the cooling of the other as current flows.

15309* Performance of Aluminum in Air Conditioners. D. G. Vandenburgh and A. J. Haygood. *Refrigerating Engineering*, v. 66, Sept. 1958, p. 42 + 8 pages.

Favorable results were obtained with properly designed Al-tube coils. A test program also revealed the advantages of Al construction for other components of the air conditioner.

See also: **14491** (computer environment).

TEXTILES, FIBERS, LEATHER, AND PAPER

15310* A Histological Study of Some Mucilaginous Seeds. Mahmoud D. Sayed and Jack L. Beal. *American Pharmaceutical Association, Journal (Scientific Ed.)*, v. 47, Aug. 1958, p. 544-547.

A description of the morphology and histology of the seeds of Kentucky coffee-tree, thornless honey locust, and sweet basil is given. Mucilage is located in the endosperm of the first two seeds and in the epidermis of the seed coat of the third.

15311* Some Anatomical Factors Relating to the Penetration of Water Into Xylem of Gymnosperms. A. B. Wardrop and G. W. Davies. *Australian Journal of Botany*, v. 6, no. 2, June 1958, p. 96-102 + 3 plates.

Sapwood specimens of *Pinus radiata* and *P. muricata* known to resist penetration by aqueous preservatives, but readily penetrated by creosote oil show the presence of fatty material, removable with alcohol and ether, and lining the lumen of pit chanbers of the tracheids.

15312* Extractives of Australian Timbers. II. Emmolic Acid, a New Triterpene Acid From *Emmenospermum alphitonioides* F. Muell. J. P. Boyer, R. A. Eade, H. Locksley, and J. J. H. Simes. *Australian Journal of Chemistry*, v. 2, no. 2, May 1958, p. 236-245.

15313* Examination of *Intsia (Afzelia) Bijuga* Bark. W. Korytnyk. *Australian Journal of Chemistry*, v. 2, no. 2, May 1958, p. 248-249.

Bark contains 0.37% of β-amyrin and 0.10% of a saturated fatty acid material having the properties of the "cerotic" acid mentioned in Beilstein.

15314* The Role of Non-Glucose Residues in Determining the Crystallinity of Native Cellulose. S. T. Bayley and C. T. Bishop. *Biochimica et Biophysica Acta*, v. 29, no. 1, July 1958, p. 209-211.

Virtually no correlation exists between content of trace residues, percentage crystallinity, and average diameter of crystalline regions.

15315* (French.) Chromosomes of *Pseudotsuga douglasii* Carriere. **Chromosomes de *Pseudotsuga douglasii* carrière.** M. Durrieu-Vabre. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 246, no. 26, June 30, 1958, p. 3660-3663.

This study reveals 24 chromosomes.

15316* (German.) The Position of the Fibers in the Yarn During Its Twist. **Die Lage der Fasern im Gespinst bei seiner Drehung.** G. W. Sokolow. *Faserforschung und Textiltechnik*, v. 9, no. 4, Apr. 1958, p. 143-145.

The fibers in the yarn are not arranged in regular concentric layers, but are migrating continually from one layer into the other. In calculation of the theoretical strength of the yarn an equal load may be assumed for all fibers.

15317* Spiral Grain in Second-Growth Douglas-Fir and Western Hemlock. G. K. Elliott. *Forest Products Journal*, v. 8, July 1958, p. 205-211.

Evidence indicates that spiral grain is the normal growth pattern in trees. In both species studied, spiral begins by increasing to the left with age, reaches a maximum, and then decreases through zero and becomes an increasing right spiral.

15318* Arrangement of Cellulose Microfibrils in Walls of Elongating Parenchyma Cells. G. Setterfield and S. T. Bayley. *Journal of Biophysical and Biochemical Cytology*, v. 4, no. 4, July 1958, p. 377-382.

15319* Polycondensations in the Formation of Catechin Tannins and of Lignin. K. Freudenberg. *Journal of Polymer Science*, v. 29, June 1958, p. 433-439.

Catechin tannins are formed by the action of protons on catechins, by condensation of the carbon atom from the ether bridge in the 2-position with one of the phenyl rings of the next molecule. Lignin is formed by dehydrogenation of *p*-hydroxycinnamic alcohols.

15320 The Chemistry & Biochemistry of the Hemicellulose Group of Polysaccharides. H. C. Srivastava. *Journal of Scientific & Industrial Research*, v. 17, sec. A. Apr. 1958, p. 165-172.

15321* (German.) Remarks on the Chemistry and Practice of the Neutralization of Chrome Leather. **Bemerkungen zur Chemie und Praxis der Neutralisation von Chromleder.** H. Spahrkäs. *Leder*, v. 9, no. 7, July 1958, p. 169-177.

The neutralizing effect of sodium, calcium, and ammonium salts of different acids is discussed from the aspect of titration and neutralization curves of chrome solutions, as well as of the deacidification of chrome leather.

15322 Effect of Gravity on Flowering and Shoot Growth in Japanese Larch (*Larix leptolepis*, Murray). K. A. Longman and P. F. Wareing. *Nature*, v. 182, Aug. 9, 1958, p. 380-381.

Flowering is markedly influenced by the position of the branches in relation to the gravitational field, the greater the branch angle (measured from vertically upwards) the heavier the flowering. In addition, trees have been brought into heavy flowering at an age when they would normally bear few or no flowers.

15323* *Podocarpus spicatus* Heartwood Extractives. H. V. Brewerton. *New Zealand Journal of Science*, v. 1, no. 2, June 1958, p. 220-223.

Four compounds have been isolated in good yields. No podocarpic acid is present in the heartwood. No matairesinol, totarol, or ferruginol was found. A simple test to distinguish between the heartwood and sapwood of matai is given.

15324* (Swedish.) Drying of Wood and Pulp and Its Influence on Pulp Production and Quality. **Törkning av ved og masse og dens innvirkning på massefabrikasjon og en del kvalitetsfaktorer.** H. P. Dahm, J. Brandal, and K. Helge. *Paperi ja Puu*, v. 40, no. 7, July 1958, p. 355 + 4 pages.

Pulp produced from wood of the higher moisture content is significantly superior in quality.

15325* Some Observations on Forest Research in the Southern United States. III. J. Newell Stephenson. *Pulp and Paper Magazine of Canada*, v. 59, July 1958, p. 170-175.

15326 (Finnish.) The Use of Mannogalactane Vegetable Gums in the Paper Industry. **Kasvilimat paperitoellisuudessa.** Anssi Kärnä and Lars Nordman. *Teollisuuden Keskuslaboratorion Tiedonantoja*, no. 197, 1958, p. 45-57. (TS1080 C33m Contin.)

15327* Man-Made Fibers. J. B. Goldberg, editor. *Textile Industries*, v. 122, Aug. 1958, p. 69-114.

A series of articles concerned with dyeing blended fabrics, Zefran processing, rayon and nylon tire cord, polyolefin fibers, and filament nylon warps.

15328 Modern Techniques in the Study of Wool Structure. F. O. Howitt and A. Robson. *Textile Institute, Journal, Proceedings*, v. 49, June 1958, p. P236-P244.

Very little is known about the chemical structure of wool. No homogeneous polypeptide has been isolated from it and no amino-acid sequences of a length greater than three have been determined.

15329 Structure and Mechanical Properties of Vegetable Fibres. II. A Micro-Extensometer for the Automatic Recording of Load-Extension Curves for Single Fibrous Cells. L. C. Spark, G. Darnbrough, and R. D. Preston. *Textile Institute, Journal, Transactions*, v. 49, July 1958, p. T309-T316.

Sample load-extension curves of two sisal fibers are presented to show the wide variation of mechanical properties with the molecular structure of fiber wall.

See also: **14129** (industrial raw materials of plant origin); **14137** (rate of sap flow in plant stem); **14191** (protein metabolism and respiration in cultured plant tissue); **14374** (reaction of cellulose nitrate with butylamine); **14442** (chemical finishes for textiles); **14469** (silicone release coatings); **14749** (check list of forestry items in a working library); **14805** (engineering properties of papers); **15246** (nylon derivatives).

WELDING AND JOINING

15330* High-Temperature Corrosion-Resistant Brazing. John V. Long and George D. Cremer. *Astronautics*, v. 3, Aug. 1958, p. 28 + 3 pages.

This process, introduced eight years ago, gives promise of producing complex, but lightweight structures that are both strong and reliable at temperatures encountered in hypervelocity flight. Some possible uses for brazed structures include composite waffle-core fuel tanks or damage control walling, precision control units, and marcel sandwich and tubing heat exchangers.

15331 The Influence of Welding on Structural Design. Alfred Pugsley. *British Welding Journal*, v. 5, July 1958, p. 297-302.

Effect of welding developments on design and use of struts, girders, plates, and other structural members in buildings, ships, and land transportation equipment.

15332 Why Weld Automatically? I. C. Fitch. *British Welding Journal*, v. 5, July 1958, p. 303-310.

Technical and economic advantages of automatic welding methods and examples of the different types of machines that can be used.

15333 Welding of Nickel and High-Nickel Alloys in the Chemical Industry. J. Hinde. *British Welding Journal*, v. 5, July 1958, p. 311-318.

Reviews major applications and metallurgical and practical aspects of the materials, with particular reference to maintenance of corrosion resistance across welded joints.

15334 Current and Pressure Wave Shapes Used in Resistance Welding. W. A. Knipe. *British Welding Journal*, v. 5, Aug. 1958, p. 341-345.

Various wave forms are described. The application of resistance welders to hot riveting is included and details are given of machines designed to take load from all phases of a 3-phase supply.

15335 Automatic Welding of Aluminium Plate. J. E. Tomlinson and D. Slater. *British Welding Journal*, v. 5, Aug. 1958, p. 361-368.

Tests described are used to predict the welding conditions for the high-quality close square butt welding of plate up to ⅝-in. thick.

15336 Properties of Fusion Welds in Unalloyed Titanium and Ti-5% Al-2½% Sn Alloy Sheet. J. C. Borland and W. G. Hull. *British Welding Journal*, v. 5, Aug. 1958, p. 374-380.

Slight porosity is due to entrapped argon gas. As-welded properties are only slightly inferior to those of the parent sheet.

15337* Seven Methods for Joining Stainless Steels. Paul Bowman. *Industry & Welding*, v. 31, Aug. 1958, p. 42 + 2 pages.

Automatic, manual and spot inert arc, resistance spot and projection, metallic arc, and Ag brazing are listed.

15338* How Would You Braze All-Metal Honeycombs? *Industry & Welding*, v. 31, Sept. 1958, p. 36 + 2 pages.

Elevator-type furnaces are being used for high-temperature brazing of all-metal honeycomb structures.

15339* Fixturing for Butt Welding Stainless Sheets Cuts Production Time From 30 Minutes to 2½ Minutes. *Industry & Welding*, v. 31, Sept. 1958, p. 40-43.

Tailor-made welding fixtures play a key role in fabricating stainless steel food service equipment.

15340 Brazing of Molybdenum. Robert E. Monroe. Paper from "The Metal Molybdenum, Symposium Proceedings". p. 192-198. 1958. American Society for Metals, Cleveland. (TN 799.M7 M56)

Molybdenum presents no unusual problems in brazing processes or procedures. Previous techniques are readily adapted for use with Mo. Knowledge of the properties and metallurgy of Mo and its alloys is the prime requirement for proper use of brazed construction. Insufficient data are available to recommend brazed structures for highly stressed high-temperature service.

15341* (German.) Metallurgical Conditions for the Welding of Clad Steel Plates. **Die metallurgischen Bedingungen für das Schweissen plattierter Stahlbleche.** W. Rädeker. *Schweissen und Schneiden*, v. 10, no. 7, July 1958, p. 255-259.

Requirements of the weld and the parent material. Welding of cladding materials and experimental results. Crack formation in the weld metal and precautions for increasing the resistance against transcrystalline cracking in the welds. Heat treatment of welds in clad materials.

15342* (German.) Selected Examples of Welding Structures in Chemical Engineering. **Ausgewählte Beispiele von Schweisskonstruktionen im chemischen Apparatebau.** Rudolf Söhngen. *Schweissen und Schneiden*, v. 10, no. 7, July 1958, p. 260-265.

Influence of welding upon the design of plant and equipment; influence of properties and position of the welded seam; design elements; examples in steel, copper, and alloys.

15343* (German.) Application of Welding in Apparatus Construction in the Chemical Industry. **Anwendung der Schweisstechnik im Apparatebau der chemischen Industrie.** P. Richter. *Schweissen und Schneiden*, v. 10, no. 7, July 1958, p. 265-269.

Design conditions for chemical plant and equipment. Welding of pipes and the connections in boiler manufacture. Hard facing of small parts. Reinforcement by welding on vessels.

15344* (German.) Contribution to Design and Calculation of Welded Hollow Bodies for High Operation Pressures and Elevated Temperatures. **Beitrag zur Gestaltung und Berechnung geschweisster Hohlkörper für hohe Betriebsdrücke und erhöhte Temperaturen.** A. F. Maier. *Schweissen und Schneiden*, v. 10, no. 7, July 1958, p. 270-276.

Requirement for chemical equipment; stress of walls; manufacturing of hollow high-pressure bodies; mechanics of casing tubes; calculation of multilayer hollow bodies.

15345 Magnesium Dip Brazed Accurately. *Steel*, v. 143, Aug. 4, 1958, p. 101.

Dip-brazing procedure minimizes distortion and improves quality of Mg wave guides.

15346* Ultrasonic Welding Comes of Age. J. Byron Jones and W. C. Potthoff. *Tool Engineer*, v. 41, no. 3, Sept. 1958, p. 90-94.

A new process makes it possible to join thick-to-thin sections, dissimilar metals, and thin foils without heating. Applications are numerous.

15347* Brazing Honeycomb Sandwich. Frank J. Filippi. *Tool Engineer*, v. 41, no. 3, Sept. 1958, p. 98-101.

Efficient bonding of the sandwich core and facing is essential. Now controlled-atmosphere and vacuum brazing have made it feasible to join high-temperature materials without corrosion.

15348 Soldering of Uranium. G. S. Hanks, D. T. Doll, J. M. Taub, and E. L. Brundige. *U. S. Atomic Energy Commission, TID*-8018, June 1958, 15 pp. (UF767 Un3ti Contin.)

The joining of U to U has been done successfully using a number of commercial soft solders and fusible alloys. The soldering characteristics of U may best be compared to those of Al.

15349 Welding Thin-Walled Uranium Cylinders. E. L. Brundige, J. M. Taub, G. S. Hanks, and D. T. Doll. *U. S. Atomic Energy Commission, TID*-8019, June 1958, 11 pp. (UF767 Un3ti Contin.)

Optimum results were obtained using the inert-gas shielded-arc method without the use of filler metal. Welding must be done in the flat position.

15350 Brazing. *Welding Engineer*, v. 43, Aug. 1958, p. 29-34.

Processes, joint designs, fluxes used, brazing alloys, and a table on brazing alloy selection.

15351 Selection, Welding of CrMo Alloy Steel Pipe. II. Jay Bland. *Welding Engineer*, v. 43, Aug. 1958, p. 42 + 3 pages.

The effects of preheat and postheat treatments on weld properties of these steels are evaluated.

15352 Honeycomb Gets New Brazing Method. Robert B. Stanton. *Welding Engineer*, v. 43, Aug. 1958, p. 62-64.

Exceptionally light, stainless steel panels which can withstand operating temperatures above 1,000 F are now being produced by new brazing technique.

15353 Industrial Applications of Magnetic-Flux Gas-Shielded Arc Welding. R. T. Telford and F. T. Stanchus. *Welding Journal*, v. 37, Aug. 1958, p. 771-778.

A number of production applications is described and the economical and technical advantages of the process are summarized.

15354 Inert-Gas-Shielded Arc Welding of Silicon and Aluminum Bronze. Paul L. Hemmes. *Welding Journal*, v. 37, Aug. 1958, p. 779-788.

Detailed information for proper joint design, welding procedures, shielding gas, operational techniques, and mechanical strength of welded joints; also operational techniques relative to welding these alloys to some other metals.

15355 Casting Weldments in a Petroleum Refinery. J. Bland, C. B. Parrish, and R. C. Wheeler. *Welding Journal*, v. 37, Aug. 1958, p. 789-798.

An evaluation of the weldability of some typical alloy-steel castings used as integral parts of process piping and auxiliary equipment.

15356 Evaluation of Spot Welds Made Through Primers and Sealers. B. A. Schevo. *Welding Journal*, v. 37, Aug. 1958, p. 799-802.

Spot welding was performed satisfactorily through one primer and four sealers. Sealers satisfactorily prevent water leaks on joints which have had sealers applied to the faying surfaces prior to spot welding.

15357 Diffusion Bonding Below 1000° F. J. T. Miemann, R. P. Sopher, and P. J. Rieppel. *Welding Journal*, v. 37, Aug. 1958, p. 337s-342s.

Certain metals can be joined by diffusion bonding at 650 F or perhaps lower. Good joints were obtained with the following metal combinations: Au-Cu, Au-Ag, Au-Pb, and Au-Al. From the standpoint of strength, Au-Cu and Au-Ag were comparable (13,000 psi. shear) and superior to the Au-Pb and Au-Al combinations which were found to be quite brittle. The diffusion-bonding technique permits the joining of Be-Cu and Monel at the age-hardening temperature of the Be-Cu.

15358 Control of Melting Rate and Metal Transfer in Gas-Shielded Metal-Arc Welding. I. Control of Electrode Melting Rate. A. Lesnewich. *Welding Journal*, v. 37, Aug. 1958, p. 343s-353s.

Heat for electrode melting was found to be produced simultaneously by the anode or cathode reactions, depending on the polarity, and resistance of the welding wire to the flow of current.

15359 The Control of Porosity in High-Nickel-Alloy Welds. G. R. Pease, R. E. Brien, and P. E. Legrand. *Welding Journal*, v. 37, Aug. 1958, p. 354s-360s.

Tests were conducted to establish what gases will cause porosity in Ni and high-Ni alloy welds, and in what amounts they are damaging. Under conditions described in this study, N was found to be extremely damaging to the weld soundness of Cr-free alloys. Oxygen, CO, and CO_2 were less so and H was relatively innocuous. Chromium-containing alloys were more resistant to damaging effects by all the gases.

15360 The Effect of Welding Speed on Strength of 6061-T4 Aluminum Joints. William L. Burch. *Welding Journal*, v. 37, Aug. 1958, p. 361s-367s.

Of the many factors studied, welding speed was the most important one affecting response to aging. Slow speeds caused high heat input, practically annealing the base metal. With increasing speeds the joint strength increased rapidly up to a speed of 15 ipm, above which the tensile strength was uniformly high at 90-95% of -T6 strength.

See also: **14938** (fatigue of pressure vessel welds); **14996** (brazing carbide tips to tool shanks); **15018** (aging of Al alloy welds); **15307** (welds for small pipes).

MISCELLANEOUS

15361 Basic Research in the Air Force. 38 pp. 1958. U. S. Air Research and Development Command, Washington, D. C. (UG633 U3.11b)

Lists fields of interest of AF Agencies and personnel to contact. Includes brief summaries of current activity.

15362 (Russian.) The Far East. **Dal'nii vostok.** V. G. Udovenko. 248 pp. 1957. Gosudarstvennoe Izdatel'ststvo Geograficheskoĭ Literatury, Moscow. (HC487.F3 Ud7d)

Economic-geographic characteristics of Primorskii and Khabarovskiĭ regions, and of Amurskii, Sakhalinskii, Kamchatskii, and Magadanskii states, intended not only for professional geographers, teachers, and instructors, but also for the reader at large.

15363 Science and Human Values. J. Bronowski. 94 pp. 1956. Julian Messner, Inc., New York. (Q171 B78s)

A book about science and man and how both can learn to live together in this age. Challenges the judgments and opinions of the past and shows us the impact of science on ethics and human values as well as on our physical environment.

15364 Soviet Strategy in the Nuclear Age. Raymond L. Garthoff. 283 pp. 1958. Frederick A. Praeger, New York. (UA770 G19s)

Attempts to discover and interpret contemporary Soviet military strategic thinking so that we can better meet its challenge through better understanding its nature.

15365 Recent Advances in the Engineering Sciences. Proceedings of Conference on Science and Technology for Deans of Engineering, Sept. 9-12, 1957. 257 pp. 1958. McGraw-Hill, New York. (TA5 C76r)

15366* A Method of Adjustment for Defective Data. Morris James Slonim and Chester H. McCall, Jr. *American Statistical Association, Journal*, v. 53, no. 283, Sept. 1958, p. 736-740.

An original method of adjusting defective data when gross errors can be detected. Method entails an assumption concerning the distribution of total errors in order to estimate the effect of undetectable errors. This type of situation could occur in almost any data-gathering activity.

15367* A Test of Variances. K. V. Ramachandran. *American Statistical Association, Journal*, v. 53, no. 283, Sept. 1958, p. 741-747.

Gives a two sided test for the equality of variances from two normal populations. The test is unbiased and possesses the monotonicity property. It is compared with the current equal tail area test.

15368 Proceedings of Symposia in Applied Mathematics. v. VIII. Calculus of Variations and Its Applications. Lawrence M. Graves, editor. 153 pp. 1958. McGraw-Hill, New York. (QA1 Sy68p)

Contains the papers presented at the Eighth Symposium in Applied Mathematics, sponsored by the American Mathematical Society and the Office of Ordnance Research on April 12-13, 1956, at the University of Chicago. Applications include elasticity and plasticity, hydrodynamics, and dynamic programming.

15369* The Biological Control of Chemical Factors in the Environment. Alfred C. Redfield. *American Scientist*, v. 46, no. 3, Sept. 1958, p. 205-221.

Discusses the relations between the statistical proportions in which certain elements enter into the biochemical cycle in the sea, and their relative availability in the water. These relations suggest that the nitrate present in sea water and the oxygen of the atmosphere have been produced in large part by organic activity, and that their quantities are determined by the requirements of the biochemical cycle.

15370 Man Among the Stars. Wolfgang D. Müller. 300 pp. 1957. George G. Harrap & Co., Ltd., London. (TL790 M88m)

Philosophical review of events culminating in the launching of Earth satellites. Surveys possibilities for space travel.

15371 Classrooms in the Factories. Harold F. Clark and Harold S. Sloan. 139 pp. 1958. Institute of Research, Fairleigh Dickinson University, Rutherford, N. J. (LC1081 C54c)

An account of educational activities conducted by American industry.

15372 Modern Mathematical Methods and Models. v. I. Multicomponent Methods. E. J. Cogan, et al. Sections individually paged. 1958. Mathematical Assn. of America. (QA37 D25m)

College text covering matrix algebra, integral and differential equations, functions of several variables, and maxima and minima problems.

15373 A Note on the Operational Solution of Linear Difference Equations. Eliahu I. Jury and Francis J. Mullin. *Franklin Institute, Journal*, v. 266, no. 3, Sept. 1958, p. 189-205.

Methods of solution are illustrated with various examples which indicate the straightforward procedure for applying the z-transform and the modified z-transform to the solution of difference equations.

15374 The Computer and the Brain. John von Neumann. 82 pp. 1958. Yale University Press, New Haven. (QA76 V89c)

Surveys analogies between computing machines and the living human brain. Concludes that the brain operates in part digitally, in part analogically, but uses a peculiar statistical language unlike that employed in the operation of man-made computers.

15375* (English.) A Simplified Method of Solution for a Random Walk Problem of a Few Unequal Steps. Denis O'Connor. *Acta Physica Polonica*, v. 17, no. 4, 1958, p. 273-279.

A simplified method is presented of calculating the probability that the amplitude of the resultant vector formed by the vector addition of a finite number of vectors of known amplitude and random orientation, will lie in a given range. This method is simpler to use for small numbers of vectors unequal in length, than methods known from the literature. Recursion formulas are given for calculating the probability functions for assemblages of vectors of equal length.

15376 Operational Mathematics. Ruel V. Churchill. 2nd Ed. 337 pp. 1958. McGraw-Hill, New York. (QA432 C47m2)

The Laplace transformation; problems in partial differential equations; functions of a complex variable; the inversion integral. Problems in heat conduction and mechanical vibrations. Sturm-Liouville systems; Fourier transforms.

15377 Proceedings of the 11th National Conference on the Administration of Research. 163 pp. 1958. Pennsylvania State University Press, University Park, Penna. (T58 C76p Vis.)

Consists of 15 papers on relationships between individual scientists and research administration problems.

15378* Research for Sale. Guy B. Gresford. *Royal Australian Chemical Institute, Proceedings*, v. 25, May 1958, p. 252-257.

Philosophy and problems of typical American research organizations are presented.

15379* Uniform Asymptotic Expansions of Solutions of Linear Second-Order Differential Equations for Large Values of a Parameter. F. W. J. Olver. *Royal Society of London, Philosophical Transactions*, v. 250, Ser. A. Mathematical and Physical Sciences, no. 984, July 31, 1958, p. 479-517.